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Academic Calendars

- Calendar: 2009-2010
- Calendar: 2010-2011

Calendar: 2009-2010

Fall 2009

Monday	Aug 24	Classes begin
Monday	Sep 7	Labor Day, classes DO meet
Friday	Oct 9	Fall Break Begins, (No Classes; university offices open)
Sunday	Oct 11	Fall Break Ends
Saturday	Nov 21	Thanksgiving Holiday begins
Sunday	Nov 29	Thanksgiving Holiday ends
Wednesday	Dec 9	Classes end
Thursday	Dec 10	Reading Day
Friday	Dec 11	Exams begin
Thursday	Dec 17	Exams end
Friday	Dec 18	Fall Commencement Ceremonies (University and Graduate)

Spring 2010

Monday	Jan 18	Martin Luther King Day. No Classes; University Offices Closed.
Tuesday	Jan 19	Classes Begin
Saturday	Mar 6	Spring Break begins
Sunday	Mar 14	Spring Break ends
Friday	Apr 16	University Remembrance. No Classes.*
Wednesday	May 5	Classes end
Thursday	May 6	Reading Day
Friday	May 7	Exams begin[1]
Wednesday	May 12	Exams end
Thursday	May 13	Senior Day
Friday	May 14	University and Graduate Commencement Ceremonies
Saturday	May 15	Spring Commencement (College Ceremonies)

Summer I 2010

Monday	May 24	Classes Begin
Monday	May 31	Memorial Day Holiday, No Classes
Thursday	Jul 1	Classes end
Friday	Jul 2	Exams begin
Monday	Jul 3	Exams end

Summer II 2010

Tuesday	Jul 6	Classes begin
Thursday	Aug 12	Classes end
Friday	Aug 13	Exams begin
Saturday	Aug 14	Exams end

Approved, University Council, 4/2/2007
*Approved, Virginia Tech President Charles W. Stegar and Senior Vice President and Provost Mark McNamee, 2/13/09.
[1]Saturday Exams

Calendar: 2010-2011

Fall 2010

Monday	Aug 23	Classes begin
Monday	Sep 6	Labor Day, classes DO meet
Friday	Oct 8	Fall Break Begins, (No Classes; university offices open)
Sunday	Oct 10	Fall Break Ends
Saturday	Nov 20	Thanksgiving Holiday begins
Sunday	Nov 28	Thanksgiving Holiday ends
Wednesday	Dec 8	Classes end
Thursday	Dec 9	Reading Day
Friday	Dec 10	Exams begin
Thursday	Dec 16	Exams end
Friday	Dec 17	Fall Commencement Ceremonies (University and Graduate)

Spring 2011

Monday	Jan 17	Martin Luther King Day. No Classes; University Offices Closed.
Tuesday	Jan 18	Classes Begin
Saturday	Mar 5	Spring Break begins
Sunday	Mar 13	Spring Break ends
Wednesday	May 4	Classes end
Thursday	May 5	Reading Day
Friday	May 6	Exams begin[1]
Wednesday	May 11	Exams end
Thursday	May 12	Senior Day
Friday	May 13	University and Graduate Commencement Ceremonies
Saturday	May 14	Spring Commencement (College Ceremonies)

Summer I 2011

Monday	May 23	Classes Begin
Monday	May 30	Memorial Day Holiday, No Classes
Thursday	Jun 30	Classes end
Friday	Jul 1	Exams begin
Saturday	Jul 2	Exams end

Summer II 2011

Tuesday	Jul 5	Classes begin
Thursday	Aug 11	Classes end
Friday	Aug 12	Exams begin
Saturday	Aug 13	Exams end

Approved, University Council, 4/2/2007
[1]Saturday Exams

General Information

Purpose and Mission of the University

Virginia Polytechnic Institute and State University, a publicly supported, comprehensive, land-grant university, serves the Commonwealth of Virginia, the nation, and the international community by generating and disseminating knowledge in the humanities, arts, social sciences, scientific, and professional disciplines through instruction, research, and extension. Inspired by its motto, "Ut Prosim" (That I May Serve), the university instills within each member of the university community an appreciation of the values and obligations of productive citizenship and the responsibilities of leadership while promoting personal and intellectual development. Its scholastic programs are accessible to all who demonstrate academic merit to gain entrance.
To achieve this mission, it will identify and build on strengths across the university, forge innovative and mutually productive relationships with industry and government, manage resources efficiently, and establish a clear identity as a forward-thinking, high-quality institution that systematically guides and evaluates its future.

Athletics, Intramurals, and Recreational Facilities

Virginia Tech has a diverse and highly active athletic program for men and women students in intercollegiate, intramural, and extramural sports. The athletic program is recognized as one of the most successful in the nation because it is geared to meet the needs of all students interested in physical and recreational sports activity.

The university has extensive and modern athletic and recreational facilities, including: Cassell Coliseum, an indoor arena seating 10,052; Lane Stadium, seating 66,233; a fully equipped recreation gymnasium, including War Memorial Pool; Rector Field House; Burrows-Burleson Tennis Center; English Baseball Field; outdoor tennis courts; the Pete Dye River Course of Virginia Tech and Virginia Tech Golf Course; Johnson/Miller Track Complex; Thompson Field for Soccer/Lacrosse; Tech Softball Park; a pond for ice skating in the winter; and the South Recreation Field Area for outdoor sports.

Virginia Tech's athletic varsity teams compete at the Division I level of the National Collegiate Athletic Association (NCAA). The university participates in the Atlantic Coast Conference for all varsity sports. Athletic scholarships are available in the following intercollegiate sports:

baseball (men) basketball (men and women) football (men) golf (men)	lacrosse (women) soccer (men and women) softball (women) swimming/diving (men and women)	tennis (men and women) indoor/outdoor track/cross country (men and women) volleyball (women) wrestling (men)

The following extramural sports clubs also are available: baseball (men's), basketball, bowling, clay target, crew, cricket, cycling, fencing, golf, women's field hockey, gymnastics, ice hockey, lacrosse, rugby, soccer, softball (women's), snow skiing, triatholon, volleyball, water polo, and water skiing.

Virginia Tech offers a wide range of intramural and recreational programs for men and women including the following sports: basketball, billiards, bowling, chess, dodgeball, flag football, hearts tournament, racquetball, golf , innertube water polo, kickball, soccer, softball, swimming, table tennis, tennis, team darts, volleyball, and wallyball, wiffleball.

The Cadet System

The Virginia Tech Corps of Cadets is one of only two programs in the United States offering a corps of cadets within a large public university.

The Corps of Cadets, a militarily structured organization, offers many leadership development opportunities to both male and female students. The Rice Center for Leader Development offers a minor in leadership studies. (Contact Colonel Dave Miller, Director, [540/231-9455] for additional information on the center.)

The Corps is supervised by the Commandant of Cadets, who establishes overall policies and methods of operation for the Corps. The cadet commanders and staff officers are responsible for implementation of policies and procedures.

Membership in the Corps involves a 24-hour-a-day commitment. Members wear a distinctive Virginia Tech cadet uniform and live in designated cadet residence halls. Both cadets and non-cadets are part of one student body, attend the same classes, and are organized into one student government. Cadets participate in all university activities, including athletics, social events, and cultural programs. Membership in the Cadet Regimental Band, the "Highty-Tighties," is restricted to cadets. Although many benefits are available through participation in one of the three ROTC programs offered at Tech, a student does not have to enroll in an ROTC program to be a member of the Corps of Cadets.

Career Services

Career Services, a unit of the Division of Student Affairs, offers services and resources to help all students in the university, from freshmen through graduate level, with the following areas of need:

1. Choosing academic majors and careers, including planning for graduate school or other further education.
2. Gaining career-related experience during college, including the Cooperative Education program (detailed below), internships and summer jobs, part-time positions, and volunteer work. Leadership in student and community organizations and travel or study abroad can also serve to build skills which are relevant to careers.
3. Learning necessary job search skills and connecting with companies for job opportunities.

Information on all of Career Services' programs, as well as direct access to many job listings, is available through our Web site at www.career.vt.edu. Appointments can be scheduled by calling 540/231-6241, and students are always welcome to visit the office on the top floor, Henderson Hall.

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Cooperative Education/Internship Program

The Co-op/Internship Program is an academic program that provides students the opportunity to combine real world work experience with classroom theory. It involves one or more semesters of paid, full-timework, and is a partnership among the student, Career Services, the academic department, and the employer. Gaining career-related experience gives the co-op/internship student the opportunity to test career goals,defray the costs of a college education, and gain an important edge in the full-time employment market.

The Cooperative Education/Internship Program Orientation is required of all students who plan to enroll in the Co-op/Internship Program. Seminars are scheduled throughout the year and are designed to walk prospective co-op and internship students through the process of enrollment in the Co-op/Internship Program. Please call (540) 231-6241 or visit www.career.vt.edu/ to find out more.

Requirements for participation in the Co-op/Internship Program:

1. Students must maintain a cumulative GPA of 2.0.
2. Students can begin work the summer after their freshman year, at the earliest. Transfer students must have completed at least one semester and earned a GPA of at least 2.0 at Virginia Tech.
3. The co-op/internship opportunity must be a paid, full-time opportunity.

Additional Notes:

1. The Co-op/Internship Program is open to any student in any major.
2. The Graduate School administers the graduate Co-op/Internship Program.
3. Engineering majors account for 88% of enrollment in the program, and business majors just under 8%. The remainding 4% are reflected in the majors listed below.
4. Colleges and academic departments participating in the Cooperative Education program are:

- **Agriculture and Life Sciences**
  Animal and Poultry Sciences
  Biochemistry
  Crop and Soil Environmental Sciences
  Environment Science
  Food Science and Technology
  Human Nutrition, Foods & Exercise
- **Architecture and Urban Studies**
  Environmental Policy & Planning
  Industrial Design
- **Engineering**
  Aerospace
  Biological Systems
  Chemical
  Civil
  Computer
  Computer Science
  Electrical
  Engineering Science and Mechanics
  Industrial and Systems
  Materials
  Mechanical
  Mining
  Ocean
- **Pamplin College of Business**
  Accounting and Information Systems
  Business Information Technology
  Economics
  Finance, Insurance, and Business Law
  Hospitality and Tourism Management
  Management
  Marketing
- **Natural Resources**
  Forestry
  Natural Resource Recreation
  Wildlife Science
  Wood Science and Forest Products
- **Liberal Arts and Human Sciences**
  Apparel, Housing and Resources Management
  Communication
  English
  History
  Political Science
- **Science**
  Biology
  Chemistry
  Economics
  Psychology

TOP

Division of Student Affairs

The Division of Student Affairs at Virginia Tech encompasses vital departments dedicated to providing a rich co-curricular experience and essential student services. Virtually every aspect of a student's life outside the classroom is represented through its departments.

The division strives to create environments, programs, and services that support the university's teaching and learning focus and its mission to 'expand personal growth and opportunity, advance social and community development, foster economic competitiveness, and improve the quality of life.'

The Division of Student Affairs consists of the following departments: Career Services, Cook Counseling Center, Corps of Cadets, Cranwell International Center, Dean of Students Office, Fraternity and Sorority Life, Housing and Dining Services, Judicial Affairs, Multicultural Programs and Services, Recreational Sports, Residence Life, Schiffert Health Center (including Campus Alcohol Abuse Prevention Center), Services for Students with Disabilities, Student Activities, and University Unions.

Each of the division's programs provide ethical, social, and civic leadership for all students. One of the greatest responsibilities of the Division of Student Affairs is to prepare Virginia Tech students to be ethical leaders in an ever-changing society.

A detailed statement of the rights and responsibilities of students is contained in the University Policies for Student Life.

The Honor Code and Honor System

The Honor Code is the university policy which defines the expected standards of conduct in academic affairs. The Virginia Tech Honor Code embodies a spirit of mutual trust and intellectual honesty that is central to the very nature of the university and represents the highest possible expression of shared values among the members of the university community.

The fundamental beliefs underlying and reflected in the Honor Code are: that trust in a person is a positive force in making that person worthy of trust, that every student has the right to live in an academic environment that is free from the injustices caused by any form of intellectual dishonesty, and that the honesty and integrity of all members of the university community contribute to its quest for truth.

The functions of the Honor System are to communicate the meaning and importance of intellectual honesty to all students of the university; to articulate and support the interest of the community in maintaining the highest standards of conduct in academic affairs; and to identify, sanction, and educate those who fail to live up to the stated expectation of the university community with regard to these standards. (Please see the "Academics" section of this catalog for details relating to the Honor Code and System.)

Information Technology

Information Technology supports computing and communications including voice and data communications, instructional technologies,

administrative processing, software support, high performance research computation, and individual help and tutorials. The website www.computing.vt.edu is a guide to specific services and support.

The data network provides rapid access to e-mail, class materials, library databases, and to the Internet to every resident in university housing. Wireless network access is available in most academic and administrative spaces across campus. Wireless facilitates mobility across the campus, and, in conjunction with the university computer requirement for laptops, tablet computers, and software, is used in the classroom setting to improve the effectiveness of teaching and learning.

Virginia Tech is committed to using information technology to enhance teaching and learning and works to ensure that teaching faculty members have the ability to use information technology effectively. The award-winning Faculty Development Institute provides faculty members with the ability to employ emerging technologies effectively. Information Technology supports learning experiences through course management systems, online evaluations, and support for video production and distribution for both on-campus and distance learning classes.

Direct support to students in information technology is provided through the 24x7 help line, 4Help (www.4help.vt.edu). InnovationSpacer is available to support advanced digital media for student presentations and class work. Computer labs offer additional options for collaboration and for access to highly specialized software. Each student is provided with an e-mail account and access to file space for storage or websites.

My VT (www.my.vt.edu) provides secure access to personal information, including course materials, one's own contact information, and billing and account information. Security of this and other information is overseen by the Information Technology Security Office, (http://www.security.vt.edu/) protected through careful maintenance of passwords and online credentials, and incorporated into development of new applications.

Information Technology facilitates research through high performance networks and high performance computing, as well as through on-going professional development support, acquisition of specialized research software, and collaborative research.

For more on the Information Technology organization, see www.it.vt.edu.

Location

The campus is located in Blacksburg, Virginia, about 38 miles southwest of Roanoke, Virginia. To reach the campus from Interstate 81, take Exit 118-B (Christiansburg) onto U.S. Rt. 460 West. Remain on 460 West to Virginia Tech. Take the Virginia Tech exit (314 East/Southgate Drive) off U.S. 460.

Detailed directions to Virginia Tech

Campus Map

McNair Scholars Program

The Ronald E. McNair Post-Baccalaureate Achievement Program (McNair Scholars Program) is designed to encourage and prepare financially disadvantaged, first-generation college students and those from groups currently underrepresented in graduate education to pursue doctoral study. Students selected as McNair Scholars will have opportunities to explore graduate education in an environment of encouragement and close support. In addition, Scholars will learn to set high academic, personal and professional goals and will get individual assistance in achieving their goals. The program offers seminars and other scholarly activities that focus on undergraduate research and graduate education, as well as guided academic and career support, a summer research experience, faculty mentorship, and effective preparation for graduate school.

Scholars attend an academic seminar series entitled, "Pathways to the Ph.D.," that is designed to:

- Assess students' academic and career skills and interests;
- Learn about the steps in the research process;
- Prepare for graduate school by researching and visiting graduate schools; and
- Learn about the graduate school application and funding processes.

Scholars also have the opportunity to participate in a paid, 10-week summer research experience at Virginia Tech that includes a myriad of support and enrichment activities, including:

- Classes to develop their research interests;
- Guided research project under the tutelage of a VT faculty member;
- Preparation for the graduate school application and funding process;
- Research presentations;
- Networking opportunities; and
- Graduate Record Examination (GRE) preparation.

The Virginia Tech McNair Scholars Program is funded through grant from the United States Department of Education. Additional information is available at the McNair Scholars Program website, http://www.mcnair.vt.edu.

MEDEX Overseas Evacuation Program

An overseas emergency evacuation program is available to faculty, staff, students and their families who may travel overseas either on business or pleasure. MEDEX provides emergency services outside your home country. Included are

- locating appropriate medical care
- evaluation and close monitoring of treatment - management of emergency medical evacuation and repatriation (transport of mortal remains)
- coordination of direct claims payments to providers
- verification of your insurance to facilitate hospital admission - continuous contact with family, physicians, and employer assistance with interrupted travel plans resulting from an emergency situation
- assistance replacing lost or stolen medications
- emergency message transmittal services
- emergency international transfer of funds
- assistance in locating lost or stolen passports
- multilingual language services in emergency situations
- coordination centers and phone numbers throughout the world

MEDEX is already a part of the Virginia Tech medical insurance offered to full-time students attending the university. For further information on MEDEX services or the student medical insurance program, contact Risk Management at telephone 540/231-7439.

Multicultural Academic Opportunities Program

The Multicultural Academic Opportunities Program (MAOP) is an academic success community founded in 1993 upon the principles of self-help, mentoring, and peer support. MAOP is committed to enhancing diversity of students in all disciplines at both the undergraduate and graduate levels. Through partnerships with various departments across Virginia Tech, other college and university peers, governmental, private, and non-profit institutions, MAOP participants are supported with academic guidance and financial support.

MAOP is open to all students who demonstrate a clear commitment to the pursuit of academic excellence and are interested in the promotion of diversity in an ever closer global community.

MAOP is committed to providing Undergraduate and Graduate Scholars with an academically challenging and comprehensive program that facilitates degree completion. The specific goals of MAOP are to:

- Increase the diversity of students who apply to, enroll, and graduate from Virginia Tech;
- Provide access and opportunity for low-income, first-generation college students to enhance their chances of success;
- Provide academic, professional and personal support programs for participants;
- Enlist the support of committed faculty members to provide exceptional research opportunities for Scholars;
- Provide support for student organizations consistent with the MAOP mission, such as MANRRS (Minorities in Agriculture, Natural Resources, and Related Sciences);
- Nurture a genuine collaboration with MAOP partners at other institutions and in business, industry, and state and federal government who share our goals and commitment to increasing diversity and student achievement at Virginia Tech; and
- Function as a visible and responsive student-centered program that increases and supports a broad understanding of diversity within the university community.

MAOP carries out these goals through five “MAOP Family” programs and a host of related activities. Programs and activities serve students from the pre-college level through the doctorate with a continuum of financial, academic, emotional, and social support, and research opportunities.

Parking Regulations

All vehicles, including motorcycles and scooters, parked on the Virginia Tech campus must be registered with the Parking Services Office and must display a university parking permit. Semester, summer, and daily parking permits are available and an appropriate fee is charged for each permit. Visitors are required to display a visitor permit, which is available at the Virginia Tech Visitor Information Center. For more information about parking or to request a parking regulations handbook, visit www.parking.vt.edu, or call 540-231-3200.

Alternative Transportation

The Alternative Transportation Program offers several options for commuter students to get to class without the hassles of parking permits and searching for parking spaces through the Commuter Alternatives Program (CAP).

CAP has two programs to fit your commuting needs.

- Carpool Program: Carpooling saves you money on parking and gas, and it's the closest thing you can get to RESERVED PARKING on campus.
- Bike, Bus, & Walk (BB&W): BB&W is available to commuter students who use alternative transportation methods as their primary means of commuting to campus. Examples include riding the Blacksburg Transit or SmartWay buses, bicycling, and walking. Registration is free and you will receive a limited number of free daily parking passes. Bicycles can be registered for free through the Virginia Tech Police Department at www.police.vt.edu.

For more information about commuter alternatives visit www.facilities.vt.edu/ot/alternative or call 540-231-0248.

The ROTC Program

The Reserve Officer Training Corps Programs conducted at Virginia Tech are available to cadets and are offered by the Army, Navy/Marine Corps, and the Air Force. All students participating in ROTC are required to be members of the Corps of Cadets. Details about courses offered, as well as available scholarships and stipends, can be found in the department listings under the College of Liberal Arts and Human Sciences; ROTC (Army), ROTC (Navy/Marine Corps), and ROTC (Air Force). Upon successful graduation from Virginia Tech and completion of the ROTC program, the student is commissioned as an officer in either an active or reserve component of the Armed Forces. The total ROTC credits applied toward degree requirements varies by major and ranges from four to 24. All credits count as free electives. Consult your course advisor for information on ROTC credits which may be used within your major.

Students interested in additional details should contact the professor of military science for Army ROTC, the professor of naval science for Naval/Marine Corps ROTC, or the professor of aerospace studies for the Air Force ROTC program.

General Rules Governing the Cadet Lifestyle

All Virginia Tech students are eligible to join the Cadet Regiment and participate in the cadet lifestyle. Cadet student status is a prerequisite for participation in any of the ROTC programs.

Physical Standards: The Department of Defense has prescribed physical standards for formal enrollment in the ROTC programs. Cadets not physically qualified for an ROTC program may remain in cadet status as members of the Corps of Cadets.

Cadet Regulations: Cadets are expected to adhere to the Cadet Honor Code and abide by all cadet regulations, directives, policies, and procedures of the Corps, as well as the rules governing civilian students.

The following summary gives the prospective cadet an understanding of the nature of his or her obligation as a cadet:

1. Cadet officers and non-commissioned officers are responsible to university authorities for the activities of the cadets under their supervision and are given the authority to discharge their responsibilities.
2. Cadet residence halls are coeducational with controlled visiting privileges for non-residents and mandatory quiet study periods.
3. Alcoholic beverages are prohibited in the cadet residence halls.
4. Cadets are required to wear the cadet uniform to classes and cadet functions.
5. Cadets are required to live in a designated cadet residence hall unless married and living with a spouse.
6. Second-semester freshmen and upperclassmen in the corps may request a change to civilian status at any time. First-semester new cadets may not leave the corps and change to civilian status until the last day to drop a class without penalty (after six weeks of class). All students are encouraged to make status changes (from cadet to civilian lifestyle or vice versa) in conjunction with the beginning or end of an academic semester.

See Academics section for details on the ROTC course credits which apply toward degrees.

- For additional information:

Commandant of Cadets	Air Force ROTC	Army ROTC	Naval/Marine Corps ROTC
143 Brodie Hall	228 Military Building	226 Military Building Hall	417 Femoyer
Virginia Tech	Virginia Tech	Virginia Tech	Virginia Tech
Blacksburg, VA 24061	Blacksburg, VA 24061	Blacksburg, VA 24061	Blacksburg, VA 24061
540/231-6858	540/231-6404	540/231-6401	540/231-7883
corpsofcadets@vt.edu	usaf@vt.edu	rotc@vt.edu	usnavy@vt.edu

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Services for Students with Disabilities

Admission to Virginia Tech is based on requirements outlined in the application and in the undergraduate and graduate catalogs. Admission decisions are made without regard to disabilities. All applicants to the university are reviewed through the same admission procedure.

Virginia Tech is committed to ensuring that all qualified individuals with disabilities have the opportunity to take part in educational and employment programs and services on an equal basis. To be eligible for services, students with disabilities must identify themselves and present professional documentation to the Services for Students with Disabilities (SSD) office. Documentation should be recent, relevant, comprehensive, and, where appropriate should contain test scores and interpretation. If the original documentation is incomplete or inadequate to determine the extent of the disability or reasonable accommodations, the university has the discretion to require additional documentation. Any cost incurred in obtaining additional or initial documentation is borne by the student. Until appropriate documentation is provided, the SSD office cannot support the student's request for services. Faculty members are not expected to provide services unless students present verification of accommodation needs from the SSD office.

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Student Health Services and Insurance

University Student Health Services

University Student Health Services provides general ambulatory health care to students throughout the year. Students who have paid their health fee (included as part of the university's comprehensive fee) and submitted a health history form are eligible for services. A team of physicians, nurse practitioners, physician assistants, certified college health nurses, and licensed practical nurses manages most common illnesses and injuries. X-ray, laboratory, and pharmacy services are available on site.

Student Medical Insurance Coverage

The university has contracted with an insurance carrier to offer group health coverage for all full-time students at Virginia Tech. For details on levels of coverage and specific limitations, please contact the Student Medical Insurance office at 540/ 231-6226.
Medical insurance is mandatory for all international students with F-1 or J-1 visas at a minimum of $50,000 accident and sickness coverage.
Medical insurance is mandatory for all College of Veterinary Medicine students at a minimum of $100,000 accident and sickness coverage.
All international students must provide written verification from their insurer that they have equal or better coverage meeting the minimums as set by the University (as outlined on the waiver form and mailed with insurance packets), or they must purchase the university-sponsored plan or another student health insurance plan meeting or exceeding the University outlined minimum levels. Review of insurance policies and completion of the waiver form must be done by the students insurer at the students request. Once the waiver is fully completed by the students insurer the university will determine if the insurance coverage meets the outlined minimum requirements.

Student Life Office

The mission of the Student Life Office is to foster a welcoming community for all students. The office supports the transition to college life, leads the response to student emergencies, serves as a voice for student concerns within the broader community, and serves as the primary point of contact for Hokie Parents

Members of the Student Life staff are available to meet with students on a walk-in basis, although appointments are appreciated. For more information about the following issues, contact the Student Life Office at 201 W. Roanoke St., (540) 231-3787:

- Advocacy for all students
- Emergency contact for students and parents
- Student Orientation
- Communication and Programs for Hokie Parents

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The Office of Student Programs

The Office of Student Programs serves students by providing facilities and services for on-campus housing, on-campus dining, fraternity and sorority life, career services, and judicial affairs. With eleven dining facilities and 45 residence halls, Student Programs offers various dining and housing options to best meet the students' needs.

Residence halls vary in size and shape and students may live in either traditional rooms or suites, single-sex or coeducational halls. Staff members promote the academic success and personal growth of residents through community development, peer advising, involvement, student advocacy, programming, and policy enforcement.

Staffing within each residence hall includes resident advisors who are responsible for community development, programming, and judicial actions with assistance from student management or professional staff. Professional live-in area coordinators/assistant directors assume primary responsibility for the supervision of the hall staffs in their assigned area. In addition, the Residence Hall Federation (RHF) focuses on improving the quality of residence hall living and implementing educational social programs for the resident communities. All residence hall students are automatically members of the RHF. Numerous leadership opportunities are available within this student organization.

All first-year students live on campus unless they fall into one of the following categories: those living with parents or other relatives, those who are married and living with their spouses, veterans of at least six months of military service, or those who are at least 21 years old. Written requests for exceptions to this policy should be directed to Housing and Dining Services, 109 East Eggleston Hall (0428).

On-campus housing is also available, but not guaranteed, for other students. The demand for a limited number of on-campus spaces necessitated the development of a random-selection process for allocation of on-campus space to non-first-year students.

Numerous dining options are available for both on-campus and off-campus students, as well as for faculty, staff, and campus visitors. All on-campus students choose a Major or Mega Flex Plan. Off-campus students, faculty, and staff may select one of five dining plans or participate in the Dining Dollars debit card program.

Dining at Virginia Tech is anything but traditional. The award-winning food service division of Student Programs specializes in preparing diverse menus in innovative, exciting venues:

- Taking traditional dining to the next level, D2 combines all-you-care-to-eat dining with the variety of an international marketplace and includes a shop dedicated to vegetarian and vegan specialties.
- Shultz Dining Center is an all-you-care-to-eat facility that serves a large selection of entrees, hot vegetables, and desserts.
- Deet's Place is a gourmet coffee, ice cream, and pastry shop, complete with a coffee roaster.
- DXpress is perfect for a quick snack on the run, such as biscuits, burgers, and pizza by the slice.
- Hokie Grill & Co. features national brands Chick-fil-A, Pizza Hut, and Cinnabon®, in addition to our own Blue Ridge Barbecue, grab-n-go sandwiches, snacks, and a soup, salad, and fruit bar.
- Owens Food Court consists of 12 specialty shops serving international and American favorites, including carved-to-order meats, freshly prepared vegetables, a soup and salad bar, burgers, pastas, sub sandwiches, Philly cheese steaks, tacos, stir-fry, and a gourmet deli.
- Shultz Express is famous for its hot bar with down-home favorites, such as biscuits and sausage gravy at breakfast and fresh whipped potatoes during lunch and dinner.
- Squires Student Center's Food Court offers pizza, pasta, calzones, and salads at Sbarro® and distinctive bakery items, upscale sandwiches, and signature soups at Au Bon Pain®.
- West End Market features wood oven-baked pizzas, grilled steaks, seafood, homemade pastas, freshly baked pastries and breads, and more—prepared right before your eyes.

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University at a Glance

Since its founding as a land-grant college in 1872, Virginia Tech has grown to become the state's largest university with an enrollment of about 26,000. With approximately 200 degree programs and more than $150 million in research expenditures each year, Virginia Tech offers the widest range of degree choices in Virginia and is the state's leading research institution.

The university offers more than 70 bachelor's degree programs through its seven undergraduate academic colleges: the College of Agriculture and Life Sciences, the College of Architecture and Urban Studies, the Pamplin College of Business, the College of Engineering, the College of Liberal Arts and Human Sciences, the College of Natural Resources, and the College of Science. On the postgraduate level, the university offers about 120 master's and doctoral degree programs through the Graduate School and the Virginia-Maryland Regional College of Veterinary Medicine.

Undergraduates study under the tutelage of the best minds of the university with about 90 percent of lecture classes taught by university faculty members, not part-time instructors or graduate students. Faculty members and students, including undergraduates, are also involved in more than 3,500 research projects in fields ranging from biotechnology to urban planning.

As a leading research institution, it's not surprising that the university has become a world-class leader in computing, information, instructional, and communications technology. That technology is permeating just about every aspect of the university, including its instruction, research, and outreach activities. It is dramatically changing how the university operates, how it teaches, how its students learn, and the reach and impact it has around the state, nation, and world.

University Counseling Center

University Counseling Services offers to all students a range of services designed to reduce the effects of personal problems, to enhance learning skills, and to promote effective educational and career decision making. The center offers both group and individual sessions throughout the year.

University Exemplary Departments

University Exemplary Department Awards recognize the work of departments that maintain, through collaborative efforts of dedicated colleagues, exemplary teaching and learning environments for students and faculty.

University Facilities

Virginia Tech has about 100 campus buildings, hundreds of research laboratories, the Corporate Research Center, an airport, 2,600 acres in Blacksburg, and a 1,700-acre research farm in Montgomery County.

Among the university's major on-campus facilities are: Carol M. Newman Library, with over 2 million volumes; Donaldson Brown Hotel and Conference Center, a conference center with 100 rooms for guests; Cassell Coliseum (seating 10,000); Lane Stadium (seating 63,459); and a communications network that provides voice, video, and computer data transmission to offices, classrooms, laboratories, and dormitory rooms; a teleport of satellite dishes for receiving and transmitting; and a computing and communications complex providing the university community with access to information systems and resources worldwide. Adjacent to campus is the Virginia Tech Corporate Research Center, which employs about 1,000 and offers businesses the opportunity to establish close working relationships with the university.

Major off-campus facilities include: the Center for European Studies and Architecture in Switzerland; the Virginia Tech/University of Virginia Northern Virginia Center in Falls Church; the Virginia Tech Roanoke Center; the Hotel Roanoke and Conference Center; public radio station WVTF in Roanoke; the Marion duPont Scott Equine Medical Center in Leesburg; the Washington-Alexandria Center of the College of Architecture and Urban Studies; a dozen agricultural experiment stations; and six 4-H centers throughout the state.

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University Libraries

The University Libraries consist of the Carol M. Newman Library and three branches: Art and Architecture, Veterinary Medicine, and the Resource Service Center located in Falls Church, Virginia. The University Libraries is a member of Association of Research Libraries, the organization of the 120 largest research libraries in North America.

The University Libraries' home page is the place to go for an overview of all of the services and resources that are available from the libraries. Library users, accessing it from on or off campus, can ask a brief reference question, place recalls on books that have been checked out, request items through Interlibrary Loan, and search Addison (the on-line catalog) or a number of online databases.

The libraries hold over 2.2 million bound volumes; 6.2 million microforms, 25,000 videos, films, cassettes and recordings; and 136,000 maps. The libraries subscribe to over 7,000 print journals and periodicals.

The libraries also provide access to electronic collections consisting of over 23,000 electronic journals and 61,000 electronic books.

The library subscribes to over 200 searchable databases for locating journal articles; a complete alphabetical listing or breakdown by subject is available from the libraries' home page. These databases cover all major disciplines. Some databases contain the articles in full text while others offer only bibliographic information; some are for specific subjects while others cover a broad range of subjects.

The Special Collections Department houses major research collections including the Archives of American Aerospace Exploration, the International Archive of Women in Architecture, Railroad Archives, and the Culinary History Collection. In addition there are a large number of collections related to the Civil War.

Each of the libraries has an Information/Help desk staffed by people who can help library patrons locate and use resources appropriate for their information needs.

For users with disabilities, there is a Special Services Room in Newman Library equipped with adaptive software and hardware.

These are some of the highlights of library services and collections available to students at Virginia Tech. For additional information on what is available the first place to look is the University Libraries' home page.

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University Unions and Student Activities

Welcome to University Unions & Student Activities, the center of Hokie community! Through UUSA, you can get involved with student activities, clubs and organizations, your student unions, leadership development, leisure and recreation, and student employment. UUSA is a unit within the Division of Student Affairs that complements the academic program and enriches the quality of student life at Virginia Tech. Everyone is welcome to take advantage of the programs, facilities, and job opportunities that UUSA has to offer.

UUSA Administrative Office
225 Squires Student Center
540/231-5431
siemens@vt.edu

www.uusa.vt.edu

The Information Services Center in Squires is staffed with knowledgeable students and full-time employees who are ready to answer questions about UUSA, the university, and the surrounding community. The Information Services Center is where you can learn more about events, get maps, or look for lost and found articles.

The Squires Information Desk
1st floor Squires lobby
540/231-6906
uusainfo@vt.edu
www.uusa.vt.edu/uusaServices/informationServices.php

Event Services facilitates and enhances programming for the Virginia Tech community by assisting and consulting in the planning and support of events. The Event Planning Office fosters an educational environment that provides student organization members and departmental representatives with coordination of events, event scheduling, liability, and risk management issues, standard procedure and protocol, and referrals to Production Services and the UUSA Ticket Office.

Event Planning
221 Squires Student Center
540/231-5005
eventplanning@vt.edu
www.uusa.vt.edu/eventServices and
www.uusa.vt.edu/eventServices/event/index.php

The Production Services Office is a full service production company for campus events. Production Services offers professional lighting, sound, staging, and rigging. The staff works one-on-one with clients to ensure event production expectations are met. Production Services is an exciting place to work!

Production Services
128 Squires Student Center
540/231-3499
production.services@vt.edu
www.uusa.vt.edu/eventServices/production/index.php

The UUSA Ticket Office is the major ticket distribution center for events other than athletics at Virginia Tech. The office supports ticket sales for theatrical and musical performances, concerts, lectures, movies, and VTU Lively Arts season subscriptions.

UUSA Ticket Office
129 Squires Student Center
540/231-5615 or
800/843-0332
uusatickets@vt.edu
www.uusa.vt.edu/eventServices/ticket/index.php

Virginia Tech Off-Campus Housing, or VTOCH, provides students with resources, programs, and services to assist with their off-campus housing needs. VTOCH's comprehensive searchable online database is consistently the most visited Virginia Tech website. You can access it on your own computer or come to the office and let the staff help you navigate our many resources. The office maintains information on local apartments, realtors, transportation, and issues affecting renters today. VTOCH hosts two housing fairs each year so students can get up close and personal with rental options and roommate fairs so students can make connections with others to share living expenses.

VTOCH Office
121 Squires Student Center
540/231-3466
vtoch@vt.edu
www.uusa.vt.edu/uusaServices/OCH/rentals/vtoch.htm

The Perspective Gallery presents art exhibitions by diverse artists working in a variety of media and styles. Visitors can view work of local and regional artists, nationally recognized artists, and artisans from around the world. Receptions and special events allow the public to meet and talk with the artists. Perspective Gallery is located on the second floor of Squires Student Center. Admission is always free. You can also enjoy works in UUSA's permanent collection, located throughout the public areas in Squires and Johnston Student Centers, the Graduate Life Center, and Cranwell International Center.

Perspective Gallery
2nd floor Squires Student Center
540/231-4053
tartaro@vt.edu
www.uusa.vt.edu/artGallery

Multicultural Programs and Services exists to assist Virginia Tech in creating a welcoming environment that affirms and celebrates the diversity of its community particularly those from underrepresented and historically marginalized populations. Guided by the Principles of Community and the concern for the holistic development of all students, MPS provides opportunities for dialogue across differences, student leadership training, cultural celebrations, mentoring, organization advising, faculty interaction, diversity training and community building.

Multicultural Programs and Services
150 Squires Student Center
540/231-8584
mps@vt.edu
http://www.mps.vt.edu/

The Black Cultural Center and Multicultural Center, as part of the Office of Multicultural Programs & Services, can be found on the first

floor of Squires. These centers are host to educational lectures, programs, and displays celebrating the diversity of the university community.

The Recital Salon and Studio Theater, home for events sponsored by the School of the Arts, are located on the second floor of Squires. Exciting and eclectic concerts and theater performances by students, faculty, and visiting artists are held throughout the year. Contact the UUSA Ticket Office or Information Services Center for more information.

RECREATION

- **The BreakZONE Recreation Center** is the place to go to relieve the stress of classes and tests! The BreakZONE sponsors competitive leagues, on-site skills classes, and open play in a variety of activities. An expanded line-up includes pool tables, new bowling lanes, table tennis, foosball, shuffleboard, DDR, and video games. Students, faculty, staff, and guests can enjoy testing their skills while relaxing with friends in an alcohol-free, club-like atmosphere. Get in the ZONE!
  BreakZONE
  117 Squires Student Center
  540/231-4476
  breakzone@vt.edu
  www.uusa.vt.edu/recreation/breakzone.php
- **Venture Out** provides fun, safe, and educational outdoor services to the university community. Venture Out specializes in low-risk outdoor adventures, quality rental gear at unbeatable rates, and valuable resource materials. Venture Out is a healthy recreational alternative and allows the university community to enjoy all that Southwest Virginia has to offer, from hiking and camping, to kayaking, horseback riding, mountain biking, and skiing.
  Venture Out
  116 Squires Student Center
  540/231-4982
  ventureout@vt.edu
  www.uusa.vt.edu/recreation/ventureOut.php

STUDENT ACTIVITIES

- **Student Activities** provides programs and experiences that promote educational, cultural, recreational, social, and personal growth. Student learning through involvement is the major focus, and is achieved in partnership with and is complementary to the academic mission of the university. An environment for co-curricular learning is created through planned programs and services in the areas of leadership, program advising, program entertainment, student organization advisement, and student organization finance. Student Activities strives to assist students in developing an appreciation for diversity, responsibility for self-learning, critical thinking, and pragmatic skills to become life-long learners, productive citizens, and community leaders.
  Student Activities
  319 Squires Student Center
  540/231-5725
  stuact@vt.edu
  www.uusa.vt.edu/studentActivities

- **Campus Programs** is made up of the offices of Student Organizations and coordinates student organization funding, registration, and support for more than 600 student groups. Campus Programs supports Virginia Tech Union, the largest student programming board, in providing events, activities, and programs for the university community. The Campus Programs office also coordinates all Homecoming activities.
  Campus Programs
  319 Squires Student Center
  540/231-1223
  monicah@vt.edu
  www.vtu.org and
  www.vthomecoming.org

- **Clubs and organizations**
  There are more than 600 officially listed student organizations at Virginia Tech. Each student organization has a different focus, and each operates under student leadership. All Virginia Tech students are encouraged to find an organization that matches their interests. The website below links you to a searchable student organization database so you can find the right organization for you.
  Search VT Student Organizations at https://banweb.banner.vt.edu/ssb/prod/hzsksorg.P_DispStuOrgs

- **Leadership Development** supports and expands upon each student's curricular contributions at Virginia Tech. We create leadership education, training, and development offerings that give students the opportunity to cultivate skills, build networks, and grow as global citizens. Student learning, through involvement, is our major focus.
  Leadership Development
  319 Squires Student Center
  540/231-4065
  ktimpany@vt.edu
  www.uusa.vt.edu/studentActivities/leadershipDevelopment.php

STUDENT CENTERS

- **Squires** (located off Alumni Mall) and **Johnston Student Centers** (located behind Burruss Hall) are hubs of activity for the university community. They serve as formal and informal meeting places for students, student organizations, and the larger university

community. Facilities include meeting rooms, conference rooms, ballrooms, and theaters. Plenty of comfortable space welcomes students. Services such as banking and ATMs can be found in these student centers, as well as a variety of dining options and a student printing center. Johnston features an internet kiosk for quick access to university information and WebMail. Many departments call Squires Student Center home. We house Multicultural Programs and Services, the music department, student media, student organization offices, the Black Cultural Center, and Legal Services. Students, faculty, staff, and guests are free to use Squires or Johnston, to meet with friends, study, attend activities and events, or just hang out.

Squires Student Center Information Desk 1st floor Squires lobby 540/231-6906 uusainfo@vt.edu www.uusa.vt.edu/facilities/Squires/index.php	Johnston Student Center Information Desk 1st floor Johnston 540/231-5266 sjoslin@vt.edu www.uusa.vt.edu/facilities/Johnston/index.php

- The Graduate Life Center at Donaldson Brown (located on Otey Street, across from Squires) is an innovative living-learning facility that supports Virginia Tech's goals for graduate education. The GLC features plenty of study space, a coffee shop, an auditorium, and a multipurpose conference room for graduate and undergraduate students.
  GLC Information Desk
  1st floor GLC lobby
  540/231-0413
  glcuusa@vt.edu
  www.uusa.vt.edu/facilities/GLC/index.php/

- The War Memorial Chapel stands prominently at the end of the Drillfield. It is the only Chapel on campus and provides a nondenominational place of solitude and meditation for all. It is host to religious services, weddings, baptisms, prayer vigils, memorial services, initiations, military commissionings, music recitals, student vocal and ministry groups, concerts, lectures, individual prayer and meditation, and bible study.
  War Memorial Chapel
  540/231-6240
  chapel@vt.edu
  www.uusa.vt.edu/facilities/Chapel/

UUSA STUDENT EMPLOYMENT

University Unions &Student Activities offers a variety of student employment opportunities to compliment your academic pursuits, afford resume-building experience, and provide income. UUSA is committed to the development and advancement of student employees through leadership and career skills training. In all we do, our main goal is to provide customer service to the patrons of our facilities and programs. Join UUSA today and work in YOUR student union!
UUSA Student Employment
225 Squires Student Center
540/231-4063
cepperly@vt.edu
www.uusa.vt.edu/uusaServices/employment.php

Contact us: The administrative offices of UUSA are located on the second floor of Squires Student Center in room 225. The office is open from 8:00 a.m. to 5:00 p.m. Monday through Friday. Please contact us for any information regarding University Unions and Student Activities.
UUSA Administrative Office
225 Squires Student Center
540/231-5431
siemens@vt.edu
www.uusa.vt.edu

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Admission Information

Academic Credentials

Academic preparation for Virginia Tech is best achieved by continued formal study of academic or college preparatory subjects. Consequently, it is recommended that required and elective academic units be evenly distributed throughout the high school years. Specifically, it is recommended that a minimum of seven (7) academic units be completed during the last two years of high school with at least three (3) academic units completed each year in the most rigorous academic programs available.

Each application is evaluated holistically. Primary criteria are: rigor of academic program, grades in academic courses, and standardized test (SAT or ACT) performance. Other criteria include alumni of Virginia Tech pipeline or TRiO program participation, special talents, first-generation college attendee, interest in the Virginia Tech Corps of Cadets, legacy, leadership and service, major, ethnicity, residency, disciplinary record, and (optional) responses to personal statements and (optional) guidance counselor reference. (While letters of recommendation are not required, if an applicant chooses to send one letter of recommendation, it must accompany the high school transcript.) For the 2009 fall semester, those offered admission had average GPAs of 3.94 (middle 50th percentile 3.71-4.15) and average combined SATs (critical reading and math) of 1250 (middle 50th percentile 1160-1330). Competitive freshman applicants will have A/B+ grades in a rigorous curriculum and strong SAT or ACT scores. Students who opt to take only the ACT also should take the ACT writing test.

Students who intend to compete in intercollegiate athletics are also required to meet all NCAA and ACC requirements for admission. Such candidates under consideration for athletic scholarships may also receive additional consideration in the admissions process.

Prospective music students must schedule an audition with the music department. Although it is not required of prospective theatre arts students, special consideration for admission will be given to applicants who audition. Applicants who wish to request an audition should contact the department head of the appropriate curriculum by January 1 of the senior year in high school.

Undergraduate Admission

Prospective students and their parents are encouraged to visit the campus at their convenience. The Office of Undergraduate Admissions is open Monday-Friday from 8:00 a.m. to 5:00 p.m. and on many Saturdays from 8:30 a.m. to noon. Admission information sessions and student-led walking tours are offered regularly. Prospective visitors should consult the 'Visit Virginia Tech' section at www.admiss.vt.edu for up-to-date schedule information. Virginia Tech does not require nor schedule a personal interview for admission.

Information on undergraduate admission may be obtained by contacting:

Office of Undergraduate Admissions
201 Burruss Hall, Virginia Tech
Blacksburg VA 24061
Phone: 540/231-6267
Fax: 540/231-3242
540/231-9175 TDD (8 a.m.-noon, 1 p.m.-5 p.m., M-F)
E-mail: vtadmiss@vt.edu
Web: http://www.admiss.vt.edu

Admission, Early

High school juniors with exceptional qualifications may be considered for admission to Virginia Tech before high school graduation. General application procedures and deadlines are the same as for seniors, with the following additional documentation also required: written

endorsement from the director of guidance or the principal; a letter from the parents or guardian supporting the decision; and a statement from the applicant outlining the reasons for seeking college entrance after the junior year. Each of these statements should address the student's academic and social preparedness for college. The applicant must rank academically in the top 10 percent of the high school junior class and have official SAT scores on record of at least 1300 (minimum 620 critical reading, 600 math). Prospective applicants should take the SAT examination during the fall of their junior year in high school so that scores will be available when freshman applications are reviewed during January, February, and March.

Admission, Freshman Process

When applying for admission as a freshman, the applicant must send the following materials to the Office of Undergraduate Admissions prior to the above deadlines:

1. Official application and application fee (non-refundable): $50 for freshmen, transfer, and non-degree students; $70 for international students.

   Please note: *we expect students to apply online at www.admiss.vt.edu.*

2. An official or unofficial copy of the secondary school record (transcript), including grades on all work through the junior year.
3. A list of the courses in which the applicant is, or will be, enrolled as a senior. The applicant's record through the first semester of the senior year is also reviewed in the freshman admissions process. Mid-year grade reports should be sent to the Office of Undergraduate Admissions as soon as available.
4. Official scores on the SAT or the ACT.
5. Discharge certificate (DD214) if the applicant is a veteran.

An **Early Decision Option** is available for students with strong qualifications and a sincere desire to attend Virginia Tech. Those interested in Early Decision must choose that option on the application form and submit all required credentials by November 1. All Early Decision applicants are notified of their admission status by December 15. Early Decision applicants may be offered admission, deferred to the regular applicant pool, or denied admission. (Students denied admission under Early Decision are no longer admissible to Virginia Tech and should not reapply for Regular Decision for the same term.) Applicants deferred to the regular decision pool will receive unbiased consideration during this admission process. Early Decision is a binding agreement in which applicants agree to apply only to Virginia Tech under an Early Decision option and, if offered admission, submit the matriculation deposit by January 15. This does not mean that Early Decision applicants cannot apply to other institutions as regular-decision applicants, but rather that Virginia Tech is their first choice and, if offered admission under Early Decision, they will withdraw applications to other institutions, and accept the Virginia Tech offer.

Freshman applicants applying for Regular Decision must submit a completed application by January 15 and will receive a notification of the admission decision by April 1. If offered admission, the applicant will receive an official offer letter, instructions to apply online for housing, and instructions to download the state-required health history form. Virginia Tech subscribes to the National Candidate's Reply Date of May 1 for freshmen offered admission for the fall semester.

Admission, International Applicants Process (Undergraduate)

International applicants for undergraduate admission are generally considered out-of-state students for tuition purposes and should apply using the Application for International Admission. International student applicants must meet all freshman or transfer requirements, as previously outlined. International freshman applicants must submit SAT or ACT scores. In addition, international students whose native language is not English must document proficiency in the English language by submitting a TOEFL (Test of English as a Foreign Language) score. Official copies of all scores must be submitted to the Office of Undergraduate Admissions.

The TOEFL test is required of all applicants who are not native speakers of English, in addition to all foreign students with visas, except those raised or schooled in Australia, Canada, Great Britain, Ireland, Jamaica, or other countries in which English is the language of instruction. A TOEFL score of at least 550 on the paper-based TOEFL test, at least 207 on the computer-based TOEFL, or a score of 80 (with no subscore below 16) on the Internet-based test is required, although achieving the minimum score is no guarantee of admission. Transfer applicants who have completed two semesters or terms of a non-ESL English composition course with above-average grades at an accredited U.S.-based college or university are not required to submit TOEFL scores.

Non-English transcripts and documents must be submitted in their original form, accompanied by a certified English translation. Unofficial documents and documents without accompanying English translations will not be accepted.

International transfer students must submit a syllabus of university study. This description of each course or subject studied (including textbook used and author) must be submitted in English or accompanied by a certified English translation of the syllabus. Applications without this information cannot be considered. All university-level work completed outside the United States must be evaluated by a professional educational credential evaluation service. (A listing of credential evaluators is linked on the online international application.) No financial aid is available for international students at the undergraduate level. All undergraduate international applicants must certify that they have sufficient funds to pay for their education at Virginia Tech prior to being issued an I-20 or IAP-66.

All international students holding F-1 and J-1 visas must purchase health and accident insurance.

The Cranwell International Center (http://www.uusa.vt.edu/cranwell/) provides a full range of services to international students at Virginia Tech. Such services include an orientation program especially designed to meet the needs of new international students, as well as immigration counseling and counseling for personal and financial problems. The center also coordinates a variety of cross-cultural programs designed to facilitate interaction between American and international students.

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Admission and Applying as a Non-Degree-Seeking Student (Undergraduate)

Virginia Tech makes every effort to provide educational opportunities to individuals who are not seeking a degree from the university, but who wish to continue their education by taking courses at Virginia Tech for college credit or, in some cases, degree credit. Such students include, but are not limited to, highly qualified high school juniors, students enrolled in other colleges or universities, and senior citizens. Non-degree applicants must be in good standing from all previously attended educational institutions.

Students who enroll at Virginia Tech under this program may not be considered candidates for degrees unless they apply formally for regular undergraduate or graduate admission. At that time, minimum requirements must be met and the applicant's academic and disciplinary record at Virginia Tech and all other colleges and universities attended would be reviewed within the context of the current competition for regular admission.

Applying as a Non-Degree-Seeking Student

When applying as a non-degree-seeking student, the applicant must send the following materials to the admissions office:

1. Official application for admission as a non-degree-seeking student, plus a $50 application fee (non-refundable). (Please note: We prefer that students apply online at www.admiss.vt.edu.) Summer-only students should apply at www.summer.vt.edu.
2. While test scores and transcripts normally are not required for non-degree-seeking students, they are required of high school students. High school students must be at the junior level or beyond, rank in the top 10 percent of their class with SAT scores of at least 1300 (minimum 620 critical reading, 600 math), and have written permission from a high school official to take a specific class. Such students cannot take a course that duplicates one offered at their high school. The Admissions Committee may request SAT scores and transcripts of any non-degree-seeking student.
3. A letter explaining the purpose of attending Virginia Tech as a non-degree-seeking student. In some cases, the Admissions Committee may request an interview.

Non-degree seeking stduents may apply online at www.admiss.vt.edu. The application should be submitted by the published deadline for the term selected (April 15 for Summer Session I, June 1 for Summer Session II, August 1 for Fall), as noted at http://www.admiss.vt.edu/apply/non_degree/dates_deadlines.php. If accepted, the applicant will receive an official notice of admission via e-mail along with other related forms.

Restrictions on Non-Degree-Seeking Students

1. Students who have been denied admission to Virginia Tech as freshmen or transfer students normally will not be eligible for reconsideration as non-degree-seeking students.
2. Non-degree-seeking students will be able to register on a space-available basis only. Until the deadline for adding classes, such students may be required to drop a class if the number of degree-seeking students exceeds the number of available spaces in a particular class.
3. Non-degree-seeking students will be permitted to attempt up to 40 hours at Virginia Tech, not to exceed 11 hours in any one term during the academic year or 5 hours in either summer school term.
4. Non-degree-seeking students are required to maintain an overall GPA of at least 2.0.
5. Non-degree-seeking students are not eligible for financial aid or scholarships.
6. Students who have previously been enrolled at Virginia Tech should not reapply as non-degree-seeking students. Former students who left the university in good standing may register for classes through Hokie SPA (http://www.hokiespa.vt.edu). Former students who did not leave the university in good standing may contact the academic dean’s office in the college in which their major was located.

Admission (Undergraduate), Transfer Process

Admission is offered on a competitive basis to transfer applicants with the strongest academic records, as long as space is available in their chosen fields of study.

Competitive applicants have a GPA of 3.0 or better. In majors where applications exceed available space such as architecture, industrial design, interior design, and landscape architecture), the competitive GPA will be considerably higher. The majors in the School of Design, which include architecture, industrial design, interior design, and landscape architecture, are reviewed on the most selective basis and generally demand GPAs above 3.7 (on a 4.0 scale). (Please note that transfer students admitted into School of Design majors will be required to begin their studies during the summer term and are required to enroll in the summer qualifying design lab.) The most important factors considered for admission are: completion or substantial progress toward completing prerequisite courses, particularly freshman

English, math, and science appropriate for the intended major; and overall GPA in college course work.

Applicants from accredited colleges and universities, including applicants from Virginia community colleges who have completed two full academic years and have received an associate's degree in the University Parallel College/Transfer Program, must (1) have completed all entrance requirements, or their equivalents, in their college developmental program; (2) have a minimum GPA of "C" (2.0 on a 4.0 scale) in all previous college work attempted; and (3) be in good standing with all colleges or universities attended. The applicant's overall grade point average and the quality of the student's former academic program are critical factors in admissions considerations. Most transfer applicants who are offered admission have a minimum GPA of 3.0 (on a 4.0 scale). Prospective applicants from the Virginia Community College System will find information about guaranteed admissions agreements at http://www.admiss.vt.edu/apply/transfer/articulation.php.

Transfer applicants must send the following application materials to the Office of Undergraduate Admissions, 104 Burruss Hall:

1. Official application and application fee (non-refundable): $50 for freshmen, transfer, and non-degree students; $70 for international students.

   Please note: *we expect students to apply online at www.admiss.vt.edu.*

2. Unofficial or official transcripts covering all college-level course work, through the last term enrolled. (To be cleared for final admission, applicants who have accepted the offer of admission must provide the admissions office with final official transcripts from all colleges previously attended in order for transfer credit to be evaluated.)
3. A list of the courses in which the applicant is currently enrolled.
4. Official and complete secondary school record, showing all grades and date of graduation. Transfer students must also meet minimum requirements set forth for high school students.
5. Discharge certificate (DD214) if the applicant is a veteran.

Completed applications are considered and decisions are made by the Admissions Committee. If offered admission, the applicant will receive an official notice of admission and related forms.

Transfer applications for summer/fall admission are due February 15, and will receive notification of the admissions decision by May 1. Students offered admission must respond to the offer by June 1. If space is available, transfer applications for spring admission are due October 1, decisions are mailed by November 15, and responses are due December 15.

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Advanced Placement

Through Advanced Placement examinations administered each year by the College Entrance Examination Board, exceptionally qualified high school graduates may be considered for advanced placement in certain subjects in which they show a proficiency. Final determination of credit will be made after the test results have been evaluated by the university. Students must have scores sent directly to the Office of the University Registrar at Virginia Tech (school code 5859) from the College Entrance Examination Board. If scores were not directed to the University Registrar at the time of the examination, contact the College Board at (888) 308-0013.

Credits allowed for advanced placement are shown as transfer hours on Hokie SPA. These credits, not to exceed 38 semester hours, are counted as hours passed when considering academic eligibility. A student may decline advanced credit only during the first semester of enrollment at Virginia Tech. Refer to the Office of the University Registrar's website at http://www.registrar.vt.edu/registration/tests_for_credit.php for information and to view the AP Credit Table. Questions about Advanced Placement credit should be directed to the Office of the University Registrar at registrar@vt.edu.

Advanced Placement Credit Table

Advanced Standing

Advanced standing refers to an arrangement that permits a student to be placed in a course without having completed the normal prerequisites. Credit may be awarded for specific courses based upon grades achieved in specific external tests and/or achievements.

Advanced standing without credit will be allowed for satisfactory completion of one to five years of study in a foreign language in a secondary school.

Advanced standing with credit will be allowed for exceptional performances on certain tests and/or achievements in mathematics, English, the International Baccalaureate program, or the terminal year at selected international secondary schools. Credit will not exceed 38 semester hours.

Credit by examination, not to exceed 12 semester hours, will be allowed by special examination where exceptional command of a subject is demonstrated.

Advanced Standing based on completion of any College-level Examination Program (CLEP) exams is granted at the discretion of the individual departments.

Applying to Graduate School

Students interested in working toward an advanced degree at Virginia Tech should contact the Graduate School for an application (www.grads.vt.edu).

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Applying to Summer Sessions

Virginia Tech offers two summer sessions of approximately six weeks each. Credit courses on other than the regular time schedule, including intensive courses for teachers, are also offered. The summer sessions program features a comprehensive offering of courses and special programs, including online courses, study abroad programs, and a few undergraduate courses in Northern Virginia.

Enrolled Virginia Tech students, as well as visiting students, are invited to participate in summer sessions. Enrolled students follow the same registration procedure for summer courses as they would for fall and spring. New or visiting students may enroll in summer sessions in either a degree or non-degree status. Such students should visit www.summer.vt.edu for information. Entering freshmen and transfer students should contact the Office of Undergraduate Admissions to be cleared for summer entry. Freshman applicants wishing to change term of entry to summer should e-mail appchange@vt.edu. Entering graduate students should contact the Graduate School.

On-campus housing is available in the summer. For more information, contact the Housing Office at 540/231-6207 or housing@vt.edu, or visit www.studentprograms.vt.edu.

Summer students have access to most university academic, athletic, and recreational facilities and programs, including the Horticulture Gardens and miles of cycling and walking trails. In addition, the Summer Arts Festival provides free movies, concerts, and exhibits.

Additional information is available at www.summer.vt.edu.

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Entrance Tests

Freshman applicants are required to take the SAT or ACT. (Students who opt to take only the ACT also should take the ACT writing test.) The SAT or ACT should be taken by the December test date of the senior year in high school or earlier, as scores are considered in the admissions application process. Information on these tests may be obtained from high school guidance directors or principals, or by writing directly to the College Entrance Examination Board, Princeton, New Jersey, or the ACT program in Iowa City, Iowa. The tests are given at centers in Virginia, in all other states, and in many foreign countries. The applicant should arrange to have all test scores sent directly to the admissions office by the testing agency or high school. Virginia Tech's CEEB number for reporting test scores is 5859. The ACT code is 4420.

International applicants whose native language is not English, and American applicants who are English-speaking but whose native language is not English also are required to take the Test of English as a Foreign Language (TOEFL).

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Equal Opportunity/Affirmative Action Statement

Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, gender, national origin, political affiliation, race, religion, sexual orientation or veteran status. Discrimination or harassment on any of these bases is prohibited by Policy 1025, "Anti-Discrimination and Harassment Prevention Policy." The university is subject to Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Age Discrimination in Employment Act, the Vietnam Era Veterans' Readjustment Assistant Act of 1974, the Federal Executive Order 11246, Virginia's State Executive Order Number Two, and all other rules and regulations that are applicable.

Policy 1025 may be viewed at http://www.policies.vt.edu/1025.pdf. Those having questions or concerns about this policy, any of these regulations, or related issues should contact: Office for Equal Opportunity, 336 Burruss Hall (0216), Blacksburg, VA 24061, (540) 231-7500, TTY: (540) 231-9460, www.oeo.vt.edu

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International Baccalaureate

Virginia Tech recognizes the International Baccalaureate (IB) diploma or individual International Baccalaureate courses with advanced standing if the student scores at least a four on the International Baccalaureate higher-level examinations. The university encourages completion of the IB diploma. Students must have scores sent directly to the Office of the University Registrar at Virginia Tech from the IBO Board. If scores were not directed to the University Registrar upon completion of the diploma or certificate, refer to the IBO website at http://www.ibo.org/ibna/graduates for information on how to have the results sent.

The additional value of the complete IB diploma is recognized in evaluating a student's record for admission and for advanced standing with credits. Subsidiary level courses are considered for advanced standing only for students who complete the IB diploma. Up to 38 semester credit hours may be granted for those earning the IB diploma, and up to 30 semester credit hours for those without the IB diploma. Credits granted for IB courses are shown as transfer hours on Hokie SPA. These credits are counted as hours passed when considering academic eligibility.

Refer to the Office of the University Registrar's website at http://www.registrar.vt.edu/registration/tests_for_credit.php for information and to view the IB Credit Table. Questions about IB credit should be directed to the Office of the University Registrar at registrar@vt.edu.

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Orientation

Freshmen: All new freshmen and their parents attend a two-day summer orientation program. Students who are entering Virginia Tech in the summer or fall will receive summer orientation information shortly after they accept Virginia Tech's offer of admission.

This summer orientation program, conducted by the Student Life Office, provides students and parents with an introduction to life at Virginia Tech. Students are required (and parents are invited) to spend the night in a residence hall, eat in campus dining halls, and participate in a wide range of programs concerning campus life. During orientation freshmen will meet with college or department representatives and register for fall semester classes.

All new students also are invited to participate in HOKIE HI activities (coordinated by Student Life) scheduled during the first several days of fall semester that includes a Welcome Back Picnic in Lane Stadium the day before classes begin. The week before classes begin in the fall the corps holds an additional one-week orientation for freshmen cadets.

Freshman students who will enter Virginia Tech in the spring semester rather than in the fall are invited to attend an orientation program in January before the beginning of spring classes.

All new transfer students attend a one-day summer orientation program in July. Information is available at www.orientation.vt.edu.

Requirements, Computer

Students are required to have their own personal computer. The university annually establishes baseline specifications for each new entering class. Transfer students are subject to the requirement that was in place for students at the same class level into which they enter. Broad specifications are announced mid-May for students entering in the fall of the next academic year. Some departments and colleges recommend a specific configuration from among the options outlined by the university. Virginia Tech requires that entering students have a laptop or tablet computer and strongly recommends that entering students obtain a computer that meets (or exceeds) the university general specifications. If you have declared a major, check the college and department specifications. Complete information about the computer requirement can be found online at www.compreq.vt.edu.

Requirements, Minimum Freshman Entrance

A student must complete a minimum of 18 units before enrolling at Virginia Tech. One unit is equal to one academic year of study in a selected course. Students who will graduate from a program other than an accredited high school program should check the 'What do we look for' section at www.admiss.vt.edu, and contact the Office of Undergraduate Admissions for additional information.

At least 14 of the 18 units must be academic or college preparatory units. Academic or college preparatory units are courses in English, language studies, mathematics, natural sciences, social sciences, and fine arts. They must be distributed as indicated below. At least a "C" average (2.0 on a 4.0 scale) is required in academic courses for the student to be considered for admission. However, because admission to Virginia Tech is competitive, those offered admission have much higher credentials.

Of the 18 required units, the following minimums must be met:

- **English** - 4 units, one in each year of high school.

- **Math** - 3 units, including algebra I, algebra II and geometry. Admission preference will be given to those who complete math beyond algebra II. A fourth unit of math is required for engineering, building construction, chemistry, computer science, mathematics, physics, and statistics majors. A fourth unit of math is strongly recommended for Pamplin College of Business majors. The fourth unit of math must include one-half unit of trigonometry and one-half unit of advanced algebra or higher mathematics. A fifth unit of math (e.g., calculus) is preferred for engineering majors.
- **Social Science** - 2 units; 1 unit must be in history.
- **Laboratory Science** - 2 units; units must be chosen from biology, chemistry, or physics. 3 units (including chemistry and physics) are required in engineering and recommended for all science-related majors.
- **Additional Academic Units** - 3 units from college preparatory courses. These may be electively chosen from English, natural sciences, social sciences, history, mathematics, computer science, language studies, and fine arts. These courses must be comparable in content and purpose to other required academic or college preparatory courses.
- The remaining 4 units may be selected from any course offerings for which the high school grants credit toward graduation.

By the time they graduate from the university, students must meet a language study requirement. The minimum requirement may be met in high school by completing 2 units of a single foreign or classical language. Some majors in the College of Liberal Arts and Human Sciences and the College of Science may require 3 units. The requirement also may be met after admission by one of the following:

- Earning 6 semester hours of college-level foreign or classical language credit.
- Receiving credit by examination for a foreign or classical language.

Such credits are in addition to that number normally required for graduation.

Virginia Tech reserves the right to deny admission to students who have been dismissed or suspended for academic or disciplinary reasons or to those convicted of a felony or a serious misdemeanor impacting the safety of the University community.

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Student Health History

Each student entering Virginia Tech must furnish a health history form, completed by a home physician, for the University Student Health Services. The form will be available online to applicants who accept the offer of admission. Failure to meet Health Services standards may result in dismissal from the university. Information is available at http://www.healthcenter.vt.edu.

Transfer Student Credentials, Evaluation of

Official final academic transcripts from all colleges previously attended should be submitted to the Office of Undergraduate Admissions. Courses from another institution in which a grade of "C-" or lower was earned, and courses taken on a pass/fail or audit basis, are not acceptable for transfer credit. Grades in transfer courses do not transfer or appear on a student's record at Virginia Tech, and are not included in a student's Virginia Tech GPA computation. Only grades of "C" or higher in courses consistent with those offered at Virginia Tech are certified for transfer credit. Credit will be awarded based on Virginia Tech policies.

Courses for which a student received credit by exam, Advanced Placement (AP) credit, or credit for life experiences at another university are not transferable. AP, IB and CLEP scores should be sent directly to the University Registrar at Virginia Tech from the testing services; credit cannot be awarded from high school transcripts. Refer to the Office of the University Registrar's website at http://www.registrar.vt.edu/registration/tests_for_credit.php for contact information for testing services and to view the AP, IB, CLEP Credit Tables.

No more than 50 percent of the credits required for graduation from Virginia Tech may be transferred from two-year colleges. To receive transfer credit, official academic transcripts from all colleges previously attended should be received in the Office of the University Registrar no later than the end of the first term of the student's enrollment at Virginia Tech. Class standing will be based upon the number of credits designated as acceptable for meeting graduation requirements. All transfer credits are used in the computation of academic eligibility. An online preliminary evaluation of transfer credit is made available to transfer applicants who have been offered admission.

International transfer students are required to submit additional documentation. For a list of required documentation see http://www.admiss.vt.edu/apply/international/checklist.php.

Virginia Tech reserves the right to deny admission to students who have been dismissed or suspended for academic or disciplinary reasons or to those convicted of a felony or a serious misdemeanor impacting the safety of the University community.

Transfer Policy of Virginia Community College Students

Per *State Policy on Transfer*, students who take their entire course work (native Virginia Community College or Richard Bland students) toward the baccalaureate degree by enrolling in transfer programs at a Virginia Community College or Richard Bland College, who graduate with associate degrees based upon a baccalaureate-oriented sequence of courses, and who are offered admission to Virginia Tech will be granted junior level status upon admission. Additionally, these students will have fulfilled the requirements of the Curriculum for Liberal Education. However, it may take such students longer than two years to complete the baccalaureate degree because of major prerequisites and other circumstances or requirements. Non-native students are those students who do not begin their college work at a Virginia Community College, or transfer credits to the Virginia Community College to complete the transfer associate degree.

Admission preference shall be given to transfer students who have completed an A.A., A.S., or A.A.S. (Associate in Arts and Sciences) at the Virginia Community College System or Richard Bland College. While some courses from the Associate of Applied Science degree from a Virginia Community College or Richard Bland College may transfer to Virginia Tech, the Associate of Applied Science degree does not transfer. Transfer students shall have the same opportunities as other students in areas of residence and dining programs, registration, and scholarships and financial aid.

Complete Virginia Tech Transfer Guide

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For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
ART	ART – GENERAL STUDIO 2D Design	CREDIT NOT APPLICABLE TO ART DEGREE	4 OR 5	ART	1204	PRINCIPLES OF ART & DESIGN I	3
ART	ART – DRAWING	CREDIT NOT APPLICABLE TO ART DEGREE	4 OR 5	ART	1404	DRAWING I	3
ART	ART – STUDIO 3-D DESIGN		3	ART	1XXX	ART ELECTIVE	3
ART	ART HISTORY		4 OR 5	ART ART	2385 2386	SURV HIST WEST ART SURV HIST WEST ART	3 3
BIOL	PRINCIPLES OF BIOLOGY	CREDIT AWARDED FOR LIFE SCIENCES MAJOR ONLY	4	BIOL BIOL	1106 1116	PRINCIPLES OF BIOLOGY PRINCIPLES OF BIOLOGY-LAB	3 1
BIOL	PRINCIPLES OF BIOLOGY	CREDIT AWARDED FOR LIFE SCIENCES MAJOR ONLY	5	BIOL BIOL BIOL BIOL	1105 1106 1115 1116	PRINCIPLES OF BIOLOGY PRINCIPLES OF BIOLOGY PRINCIPLES OF BIOLOGY-LAB PRINCIPLES OF BIOLOGY-LAB	3 3 1 1
BIOL	GENERAL BIOLOGY	CREDIT NOT APPLICABLE TO LIFE SCIENCES DEGREE	4	BIOL BIOL	1006 1016	GENERAL BIOLOGY GENERAL BIOLOGY-LAB	3 1
BIOL	GENERAL BIOLOGY	CREDIT NOT APPLICABLE TO LIFE SCIENCES DEGREE	5	BIOL BIOL BIOL BIOL	1005 1006 1015 1016	GENERAL BIOLOGY GENERAL BIOLOGY GENERAL BIOLOGY-LAB GENERAL BIOLOGY-LAB	3 3 1 1
CHEM	CHEMISTRY		4 OR 5	CHEM CHEM CHEM CHEM	1035 1045 1036 1046	GENERAL CHEMISTRY GENERAL CHEMISTRY LAB GENERAL CHEMISTRY GENERAL CHEMISTRY-LAB	3 1 3 1

For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
CHIN	MANDARIN CHINESE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	CHN	1XXX	CHINESE ELECTIVE	3
CHIN	MANDARIN CHINESE		4	CHN CHN	1XXX 2XXX	CHINESE ELECTIVE CHINESE ELECTIVE	3 3
CHIN	MANDARIN CHINESE		5	CHN CHN	2XXX 2XXX	CHINESE ELECTIVE CHINESE ELECTIVE	3 3
CS	COMPUTER SCIENCE A		4 OR 5	CS	1705	INTRO OBJ-ORIENTED DEVELOPMENT	3
CS	COMPUTER SCIENCE AB		3 OR 4	CS	1705	INTRO OBJ-ORIENTED DEVELOPMENT	3
CS	COMPUTER SCIENCE AB		5	CS CS	1705 1XXX	INTRO OBJ-ORIENTED DEVELOPMENT CS ELECTIVE	3 3
ECON	MACROECONOMICS		4 OR 5	ECON	2006	PRINCIPLES OF ECONOMICS	3
ECON	MICROECONOMICS		4 OR 5	ECON	2005	PRINCIPLES OF ECONOMICS	3
ENGL	ENGLISH – LANG/COMP OR LIT/COMP	CREDIT WILL BE AWARDED FOR LANGUAGE OR LITERATURE, BUT NOT BOTH	3	ENGL	1105	FRESHMAN ENGLISH	3
ENGL	ENGLISH – LANG/COMP OR LIT/COMP		4 OR 5	ENGL ENGL	1105 1106	FRESHMAN ENGLISH FRESHMAN ENGLISH	3 3
ENSC	ENVIRONMENTAL SCIENCE		3 OR 4	ENSC	1XXX	ENVIRONMENTAL SCIENCE ELECTIVE	3
ENSC	ENVIRONMENTAL SCIENCE		5	ENSC ENSC	1XXX 1XXX	ENVIRONMENTAL SCIENCE ELECTIVE ENVIRONMENTAL SCIENCE ELECTIVE	3 3

For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
FR	FRENCH LANGUAGE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	FR	2XXX	FRENCH ELECTIVE	3
FR	FRENCH LANGUAGE		4	FR	3XXX	FRENCH ELECTIVE	3
FR	FRENCH LANGUAGE		5	FR FR	3XXX 3XXX	FRENCH ELECTIVE FRENCH ELECTIVE	3 3
FR	FRENCH LITERATURE		3 OR 4	FR	3XXX	FRENCH ELECTIVE	3
FR	FRENCH LITERATURE		5	FR FR	3XXX 3XXX	FRENCH ELECTIVE FRENCH ELECTIVE	3 3
GEOG	HUMAN GEOGRAPHY		3	GEOG	1004	INTRO HUMAN GEOGRAPHY	3
GER	GERMAN LANGUAGE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	GER	2XXX	GERMAN ELECTIVE	3
GER	GERMAN LANGUAGE		4	GER	3XXX	GERMAN ELECTIVE	3
GER	GERMAN LANGUAGE		5	GER GER	3XXX 3XXX	GERMAN ELECTIVE GERMAN ELECTIVE	3 3
HIST	U.S. HISTORY		3	HIST	1115	HISTORY OF THE US	3
HIST	U.S. HISTORY		4 OR 5	HIST HIST	1115 1116	HISTORY OF THE US HISTORY OF THE US	3 3
HIST	EUROPEAN HISTORY		3	HIST	1025	INTRO EUROPEAN CIV	3
HIST	EUROPEAN HISTORY		4 OR 5	HIST HIST	1025 1026	INTRO EUROPEAN CIV INTRO EUROPEAN CIV	3 3
HIST	WORLD HISTORY		3	HIST	1214	HISTORY OF THE MODERN WORLD	3
HIST	WORLD HISTORY		4 OR 5	HIST HIST	1214 1XXX	HISTORY OF THE MODERN WORLD HISTORY ELECTIVE	3 3

For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
JPN	JAPANESE LANGUAGE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	JPN	1XXX	JAPANESE ELECTIVE	3
JPN	JAPANESE LANGUAGE		4	JPN JPN	1XXX 2XXX	JAPANESE ELECTIVE JAPANESE ELECTIVE	3 3
JPN	JAPANESE LANGUAGE		5	JPN JPN	2XXX 2XXX	JAPANESE ELECTIVE JAPANESE ELECTIVE	3 3
LAT	LATIN LITERATURE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	LAT	2XXX	LATIN ELECTIVE	3
LAT	LATIN LITERATURE		4 OR 5	LAT LAT	2XXX 2XXX	LATIN ELECTIVE LATIN ELECTIVE	3 3
LAT	LATIN: VERGIL	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	LAT	2XXX	LATIN ELECTIVE	3

For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
LAT	LATIN: VERGIL		4 OR 5	LAT LAT	2XXX 2XXX	LATIN ELECTIVE LATIN ELECTIVE	3 3
MATH	CALCULUS AB		3, 4, OR 5	MATH	1205	CALCULUS	3
MATH	CALCULUS BC		3	MATH	1205	CALCULUS	3
MATH	CALCULUS BC		4 OR 5	MATH MATH	1205 1206	CALCULUS CALCULUS	3 3
MUS	MUSIC LISTENING & LIT		3,4, OR 5	MUS	1104	MUSIC APPRECIATION	3
MUS	MUSIC/THEORY		3	MUS	2025	THEORY/HARMONY	3
MUS	MUSIC/THEORY		4 OR 5	MUS MUS	2025 2026	THEORY/HARMONY THEORY/HARMONY	3 3
PHYS	PHYSICS B	CREDIT NOT APPLICABLE TO ENGR OR PHYS DEGREE	3 OR 4	PHYS PHYS	2205 2215	GENERAL PHYSICS GENERAL PHYSICS-LAB	3 1
PHYS	PHYSICS B		5	PHYS PHYS PHYS PHYS	2205 2206 2215 2216	GENERAL PHYSICS GENERAL PHYSICS GENERAL PHYSICS-LAB GENERAL PHYSICS-LAB	3 3 1 1
PHYS	PHYSICS C – MECH Exam 80	CREDIT NOT APPLICABLE TO ENGR OR PHYS DEGREE	3 OR 4	PHYS PHYS	2205 2215	GENERAL PHYSICS GENERAL PHYSICS-LAB	3 1
PHYS	PHYSICS C – MECH Exam 80		5	PHYS	2305	FOUNDATIONS OF PHYSICS	4
PHYS	PHYSICS C – E & M Exam 82		5	PHYS	2306	FOUNDATIONS OF PHYSICS	4
PSCI	GOVT & POL U.S.		4 OR 5	PSCI	1014	INTRO AMERICAN GOVERNMENT AND POLITICS	3
PSCI	GOVT & POL COMP		4 OR 5	PSCI	1024	COMPARATIVE GOVERNMENT	3
PSYC	PSYCHOLOGY		4 OR 5	PSYC	2004	INTRO PSYCHOLOGY	3

For Students Entering Summer or Fall 2009

Advanced Placement Test for Credit at Virginia Tech				Virginia Tech Course Equivalent A maximum of 38 credit hours may be awarded			
SUBJ	**TITLE**	**COMMENTS**	**Minimum Advanced Placement Score**	**SUBJ**	**COURSE NO**	**COURSE TITLE**	**CREDIT HOURS**
SPAN	SPANISH LANGUAGE	MUST SEE DEPT HEAD, FOREIGN LANGUAGES AND LITERATURE, TO RECEIVE 2000 OR 3000 LEVEL COURSES IN LIEU OF ELECTIVE CREDIT	3	SPAN	2XXX	SPANISH ELECTIVE	3
SPAN	SPANISH LANGUAGE		4	SPAN	3XXX	SPANISH ELECTIVE	3
SPAN	SPANISH LANGUAGE		5	SPAN SPAN	3XXX 3XXX	SPANISH ELECTIVE SPANISH ELECTIVE	3 3
SPAN	SPANISH LITERATURE		3 OR 4	SPAN	3XXX	SPANISH ELECTIVE	3
SPAN	SPANISH LITERATURE		5	SPAN SPAN	3XXX 3XXX	SPANISH ELECTIVE SPANISH ELECTIVE	3 3
STAT	STATISTICS		3 OR 4	STAT	2004	INTRO STATISTICS	3
STAT	STATISTICS		5	STAT	3005	STATISTICAL METHODS	3

Financial Information

Academic Common Market Programs

Through a cooperative tuition-reduction agreement among Southern Regional Education Board (SREB) states, students from participating states may be able to arrange a waiver of out-of-state tuition charges in order to pursue a degree program at Virginia Tech that is not offered by a public institution in the student's home state. Students are eligible for in-state tuition provided that they have been officially accepted into the ACM major, certified by their home state higher education commission, and are making progress toward their ACM program. Students must maintain continuous full-time enrollment and progress toward their approved ACM program for continued eligibility.

The programs covered by the Academic Common Market are subject to change without notice. It is the responsibility of the student to inquire about eligibility. Program availability varies by state. Contact the Office of Undergraduate Admissions for a current listing. Currently Virginia Tech offers programs not available in public institutions in SREB participating states of Alabama, Delaware, Georgia, Kentucky, Louisiana, Maryland, Mississippi, South Carolina, Tennessee, and West Virginia.

Students are responsible for contacting the Academic Common Market Coordinator in their state's higher education office. The state coordinator can assist students in certifying eligibility and providing information regarding eligibility for in-state tuition at Virginia Tech. For additional information, and a list of qualifying programs, please visit http://www.registrar.vt.edu/records/common_market.php.

Auditing

Students are assessed the same rate for tuition and fees for auditing courses as for courses taken for credit.

Billing Statements (E-bill)

E-Bills are processed monthly on the 15th of each month (if the 15th of the month occurs on a weekend, e-bills are processed on the Friday before the 15th). Payment is due by the 10th of the following month. (If the 10th of the month occurs on a weekend, payment will be due the following Monday.)

E-bills for fall semester 2009 charges will be processed July 15 with an August 10th due date. If a dining plan, a room fee, or additional courses are added after the July 15 e-bill is processed, the additional charges will be billed in August with a September due date.

E-bills for spring semester 2010 charges will be processed December 15 with a January 11 due date.

A monthly finance charge of .667 per month (8% per annum) will be assessed on unpaid prior term charges.

Budget Tuition Plan

Virginia Tech's Budget Tuition Plan (BTP) offers a convenient method for planning and budgeting tuition, fees, room, and board. The BTP can cover all or part of the fall and/or spring semester institutional charges. This plan provides the opportunity for the student or parent(s) to divide the institutional charges into four monthly direct debits per semester or eight monthly direct debits per academic year from a checking account, instead of paying the entire amount of charges by tuition payment deadline each semester. The only cost for this service is a $65 non-refundable application fee that is due with the application. Students can join the BTP online through HOKIE SPA or parents can download the 2009/10 BTP Brochure & application from our website.Contact the Office of the University Bursar for additional information, at (540) 231-9316, e-mail BTHELP@vt.edu, or visit www.bursar.vt.edu.

Bursar, Office of University

The Office of the University Bursar provides monthly billing statements to students by sending electronic bill notifications (e-bills) to the students' Virginia Tech e-mail addresses. Payments can be made by one of the electronic payment options available to the student on Hokie SPA, by mailing a paper check, or in person at the Bursar Customer Service windows in 150 Student Services Building. Students may designate their parents or others as authorized payers on their account. This will allow the authorized payer to receive the electronic bill notification along with the student. The authorized payer will be able to view the account and/or make payments electronically on the student's account. If a student wishes financial information released to parents or others the student must grant access to this information on the FERPA release form on the HOKIE SPA.
Detailed information regarding tuition and fees, payment deadlines, Customer Service Window hours, The Budget Tuition Plan, electronic billing and payment processes, and much more can be obtained by viewing the Bursar's website http://www.bursar.vt.edu.

Collection of Past Due Receivables for Students

Any amount owed to the university including, but not limited to, tuition, fees, room, board, loans, notes receivable, and amounts due for goods and services provided is considered a receivable to the university. A receivable becomes past due if payment is not received by the payment due date. At ninety days past due, the receivable becomes delinquent.

For currently enrolled students, the primary collection tool is the placement of a "HOLD" by the Office of the University Bursar on a student's record. This "HOLD" restricts certain student activities such as the ability to add or drop classes, receive grade transcripts, register for future academic terms, and may also result in a hold on your diploma if you are a candidate for graduation. Once established, the "HOLD" remains in place until the debt is paid in full. When a student is no longer enrolled, the collection procedures utilized for other "non-student" receivables are implemented.

Individuals who do not pay all fees and charges owed are responsible, in the event of their default or the return of a check for payment of said fees and charges, to pay a penalty fee, to pay interest at the highest rate allowed by law, and for all reasonable administrative costs, collections costs, and attorney's fees incurred in the collection of funds due the University.

Addresses must be kept current and can be changed by students as needed on Hokie SPA. Non-receipt of e-bill notification is not a valid defense for non-payment; it is the responsibility of the individual who has incurred the debt to see that the debt is discharged.

For non-students, a dunning message is included on each month's statement alerting the customer to the next collection steps that will be taken. If payment is not forthcoming within the stated period, the account and all pertinent information are forwarded to an outside collection agency for further collection efforts. In addition, the account is reported to national credit bureaus, thus affecting the debtor's credit rating.

In addition to the above measures, the university also lists the account with the Virginia Department of Taxation for set-off debt collection procedures. This means that any state income tax refund or payment processed through the State Treasurer's Office to the debtor will be reduced by the amount of the receivable owed by the debtor.

Virginia Polytechnic Institute and State University is in full compliance with the Virginia Debt Collection Act and all regulations promulgated by the State Department of Accounts and the Office of the Attorney General.

Office of the University Bursar
150 Student Services Building
540/231-6277
Fax: 540/231-3238
E-mail: bursar@vt.edu
Web: www.bursar.vt.edu

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Eligibility for In-State Student Tuition Privileges

General Information: Eligibility for in-state tuition privileges (reduced tuition charges) is governed by §23-7.4 of the Code of Virginia. The provisions of §23-7.4 of the Code of Virginia are set forth, defined, and discussed in the State Council of Higher Education for Virginia's Domicile Guidelines. SCHEV developed these Guidelines to facilitate the consideration of uniform criteria in determining domiciliary status. §23-7.4 of the Code of Virginia places the responsibility on the student for establishing by clear and convincing evidence that s/he is eligible for the in-state tuition rate. Further, the burden is on the applicant to demonstrate by clear and convincing evidence that his/her domicile is Virginia and that s/he has abandoned any prior domicile. According to SCHEV's Guidelines, clear and convincing evidence is defined as "that degree of proof that will produce a firm conviction or a firm belief as to the facts sought to be established. The evidence must justify the claim both clearly and convincingly."

Domicile: Domicile refers to the "present, fixed home of an individual to which he or she returns following temporary absences, and at which the individual intends to remain indefinitely. No individual may have more than one domicile at a time." Domicile cannot be initially established in Virginia unless one actually resides, in the sense of being physically present, in Virginia with domiciliary intent, which means present intent to remain indefinitely, that is, the individual has no plans or expectation to move from Virginia. Residence in Virginia for a

temporary purpose or stay, even if that stay is lengthy, with present intent to return to a former state or country upon completion of such purpose does not constitute domicile. "Mere physical presence or residency primarily for educational purposes does not confer domiciliary status." A person shall not ordinarily be able to establish domicile by performing acts which are auxiliary to fulfilling educational objectives or which are required or routinely performed by temporary residents of the Commonwealth. The university will consider many factors when determining domicile. Among them are continuous physical residence, state to which income taxes are paid, driver's license, voter registration, motor vehicle registration, employment, property ownership, sources of financial support, military records, a written offer and acceptance of employment in Virginia following graduation, and any other social or economic relationships with the Commonwealth and other jurisdictions. The presence of any or all of these factors does not automatically result in Virginia domicile. The factors used to support a claim of entitlement to in-state privileges must have existed for a minimum of one year (12 continuous months) prior to the first official day of classes.

Reclassification: Students may seek reclassification of their initial tuition classification, but residence or physical presence in Virginia primarily to attend the university does not entitle students to in-state tuition rates. Domicile should be established BEFORE one enters the university. Please note that if a student enters the university classified as an out-of-state student, s/he must present clear and convincing evidence to rebut the presumption that s/he is residing in the state primarily to attend school. Students seeking reclassification to in-state status must be prepared to pay the out-of-state tuition rate unless they are notified in writing that his/her status has been reclassified to in-state according to the Code of Virginia.

Application Deadlines: According to §23-7.4 of the Code of Virginia, changes in domiciliary status can only be granted prospectively from the date the application is received; therefore, the deadline for submission of the complete application is prior to the first day of the term/ semester for which the student seeks reclassification to in-state. Retroactive changes in status are not allowed under the Code. To ensure that students have a decision before the tuition payment deadline, please submit a complete application at least 30 days prior to the tuition payment deadline as published by the Office of the University Bursar. If additional information is requested, the applicant must provide the additional information within 30 days of the date of the letter requesting the information. Tuition refunds may be given to students who paid their tuition at the out-of-state rate but were subsequently reclassified to in-state provided that the Application for Virginia In-State Tuition Rates was submitted before the first day of the term. Qualifying students should contact the Office of Student Accounts regarding eligibility for a refund.

Contact:

New Undergraduate or Transfer Students please contact:
Office of Undergraduate Admissions
201 Burruss Hall, Mail Code 0202
Blacksburg, VA 24061
540/231-6267

Continuing Undergraduate Students please contact:
Office of the University Registrar
250 Student Services Building, Mail Code 0134
Blacksburg, VA 24061
540/231-6252

The regulations governing domicile are determined by state law, and are therefore subject to change. The information stated herein is not intended to be a contract between a student and Virginia Tech but is provided for informational purposes only. For additional information, please visit http://www.registrar.vt.edu/records/residency.php.

Enrollment Status, Full-Time

Certification of full-time student status, for most purposes, U.S. Department of Veterans Affairs (V.A.) educational benefits, Social Security benefits, loans, scholarships, and grants, is based on the following enrollment information: official undergraduate and College of Veterinary Medicine enrollment for each regular semester must be 12 or more credit hours and official graduate enrollment for each regular semester must be 9 or more credit hours. All courses must be in the A/F option, P/F option, or equivalent credit. Please note that courses taken under the audit option do not count toward the enrollment status. Participation in the Virginia Tech Cooperative Education program, National Student Exchange program, and International Student Exchange program reflects full-time enrollment. Certification of enrollment for V.A. educational benefits will reflect only those hours considered to be progress toward the degree or educational objective. Although considered to be enrolled full-time, students who participate in the Cooperative Education program are not eligible for V.A. educational benefits or federal financial aid during the terms in which they participate in the Co-Op program.

Fees, Cooperative Education Program

Charge for each term a student is placed in industry employment while enrolled in the Cooperative Education Program.

Fall & Spring terms	$50.00 per term
Summer terms	$25.00 per term

Fees, Late Payment

The late fee charge is 10% of unpaid balance up to a maximum of $100 per term if payment is not received by the due date on the billing statement.

Fees, Reinstatement

Classes are dropped for non-payment of past due billed charges after the tenth day of classes for fall and spring semesters. A $75.00 reinstatement fee is assessed to students whose class registrations are cancelled due to non-payment of fees. The $75 reinstatement fee is in addition to the late payment fee which is 10% of unpaid balance up to a maximum of $100 per term. Students must report to the Office of the University Bursar, 150 Student Services Building, to pay charges in full and have hold removed from record before the academic dean can reinstate courses. Students will be provided a memo showing payment has been made to present to the academic dean when requesting reinstatement of classes.

Fees, Summer School

Information on summer school tuition and fees as well as costs for room and board can be obtained on the Bursar's website.

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Medical Resignations

A student resigning for medical reasons will be charged a daily tuition rate for each day enrolled.

Resignations for medical reasons must be approved by Schiffert Health Center or Cook Counseling Center at Virginia Tech indicating the student is unable to continue in school due to medical reasons. Schiffert Health Center or Cook Counseling Center will determine the effective date for a medical resignation. The Academic Fee, Technology Fee, Capital Fee and Comprehensive Fees are non refundable and no reduction will be made after the first day of classes for resignations.

Military Withdrawals

Students called into active military duty are encouraged to communicate with their advisors, instructors, and undergraduate or graduate deans to arrange "incompletes" or rescheduling of remaining work if their orders are received near the end of a term. However, if students request a withdrawal from the university, permission is granted without punitive action as well as granting a full refund of tuition and fees. This full refund is requested regardless of the date of the action of withdrawal. Procedurally, students (or their parents or guardians) are requested to provide copies of activation orders. If orders are unobtainable (in some emergency call-ups, this is possible), the University Registrar will telephone the company commander for verbal confirmation. Further, the University Registrar will serve as facilitator of this process for any advisor, instructor, or dean seeking verification of the students' military status. Students with Federal Financial Aid should be advised that full refund of tuition will result in an immediate requirement to commence repayment of aid. Students with federal financial aid are to be given the option of full or partial refund. Students are to work with their advisors and deans in requesting reinstatement to the university.

Payment Directions

Payment should be made by cash, check, cashier’s check, money order, Budget Tuition Plan, or by one of the on-line electronic payment processes for the amount due by the date shown on the e-bill. Payments sent by mail should be payable to “Treasurer of Virginia Tech” and should be mailed to: Virginia Tech, P.O. Box 7620, Merrifield, VA 22116-7620. The bottom portion of the bill should be sent along with the check to prevent delays in processing. Do not use the payment address listed on the statement for certified or express mail, scholarship checks, or any other correspondence. Those items should be sent to: Virginia Tech, Office of the University Bursar, 150 Student Services Building, Blacksburg, VA 24061. If you are using a bill paying service through your bank, please request your payment be mailed directly to Office of the University Bursar, 150 Student Services Building, Blacksburg, VA 24061. A payment made through a bill paying service does not include a payment stub so payments mailed to our processing center will result in a delay in posting the payment to the student’s account. Paying by e-check through our on-line electronic payment process is recommended as your payment will post to your student account immediately.

Payment Information

The Office of the University Bursar provides monthly e-bills to students for all new account activity and any previous balance (if applicable). The statements are available on-line for viewing and payment through an electronic payment system called QuikPAY™. Paper bills are no longer mailed. All students and authorized payers will be notified by an e-mail when the bill is available for viewing. The student or authorized payer can elect to pay by one of the electronic payment options or by printing the bill and mailing it along with their paper check to the remit to address listed on the e-bill.

The QuikPAY™ system allows for account management 24 hours a day 7 days a week and was developed under the highest Internet security standards. It features a web-based presentation of the student's most recent monthly account statement and up to 12 months of statement history. Students and authorized payers can pay their statement balance or the current account balance shown on the Hokie SPA by e-check or by credit card.

The QuikPay™ system will send email notifications to all official Virginia Tech (vt.edu) email addresses and to email addresses of authorized payers when an e-bill is available for viewing. The email will have instructions on how to view and pay the e-bill. If payment is made by one of the electronic payment options, an e-mail confirmation is sent to the payer and the student acknowledging payment. Payment can be viewed on the student's Hokie SPA account immediately. .

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Financial Information

Financial Aid

Virginia Tech awards financial aid to qualified students in the form of scholarships, grants, loans, and employment.

To apply, entering freshmen, transfer students and returning Virginia Tech students should submit the Free Application for Federal Student Aid (FAFSA) electronically at www.fafsa.ed.gov. The Office of University Scholarships and Financial Aid priority deadline is March 1 for the upcoming academic year.

The priority deadline applies to all aid programs except the Federal Pell Grant, Federal Stafford Loan Federal GradPLUSand Federal PLUS Loan Programs.

Applicants for scholarships and financial aid must list Virginia Tech's institutional code number, 003754 on the FAFSA for the analysis of the FAFSA to be sent to the university's Office of University Scholarships and Financial Aid. Elibible non-citizens must submit a copy of the alien registration card or arrival departure record each year. Students or parents must complete and submit a new FAFSA to the federal processing agency each year to be considered for aid at Virginia Tech.

The electronic FAFSA application is available each year after January 1. All offers of financial aid are contingent upon receipt of anticipated federal and state funds by the university. Awards may be reduced or canceled if anticipated funds are not received. Offers of financial aid are subject to full-time enrollment and student's meeting the Reasonable Academic Progress Policy requirements.

Virginia Tech administers a comprehensive scholarship and financial aid program to support the financial need of students and parents. More than 70 percent of Virginia Tech students receive some form of aid.

Eligibility Requirements

To be eligible to receive aid from state and federal need-based programs, an applicant must meet the following eligibility requirements: meet university application requirements; be enrolled or accepted for enrollment as a degree-seeking student; be a citizen or an eligible non-citizen; submit a completed FAFSA; and be making reasonable academic progress as defined by the university policy for Title IV recipients. Full-time enrollment is required for the majority of federal, state, and institutional programs. Students should consult with a financial aid counselor to determine the effect of less than full time enrollment with financial aid programs.

Virginia Tech participates in the following aid programs:

Federal Title IV Programs

Federal Work-Study Program: This federal program provides employment opportunities to students with demonstrated financial need. Eligible undergraduate and graduate students are limited to 20 hours of work per week while Virginia Tech is in session. All Federal Work-Study Program jobs pay at least minimum wage.

William D. Ford Federal Direct Loan Program: This federal program encompasses Federal Stafford, Grad PLUS, and PLUS Loans. Federal Stafford Loans are long-term, low-interest loans guaranteed by the federal government for the educational expenses of eligible students enrolled at least half-time. Students apply for Subsidized Federal Stafford Loans (need-based) and Unsubsidized Federal Stafford Loans (non-need-based) through the financial aid. Repayment begins six months after the student ceases at least half-time enrollment.. The Federal PLUS Loan is available to parents of undergraduate dependent students enrolled at least half-time at an institution of higher education. Parents may borrow up to the cost of attendance minus any financial aid for which the student qualifies. Similarly, the Federal Grad PLUS provides additional loan funds to graduate students that have exhausted eligibility in the Federal Stafford Loan Program. Students must file the Free Application for Federal Student Aid (FAFSA) to be considered for these loan programs.

Federal Perkins Loans: This federal program provides long-term, low-interest loans from Virginia Tech to students with financial need. The interest rate to first-time borrowers is 5 percent. Repayment of both principal and interest begins when a student ceases to be enrolled at least half-time.

Federal Pell Grant Program: Federal Pell Grants are awarded from the federal government to undergraduate students with financial need.

This program is intended to provide grant support to lower income families. Students must be pursuing a first bachelor's degree to receive the Federal Pell Grant.

Federal Supplemental Educational Opportunity Grant: Virginia Tech awards grants from federal funds to undergraduate students with extraordinary financial need. These funds are restricted to Pell-eligible students.

Commonwealth of Virginia Programs

College Scholarship Assistance Program: This need-based grant program is administered by the State Council of Higher Education for Virginia and is funded jointly by both the federal government and state resources. Recipients are selected by Virginia Tech from among eligible undergraduate Virginia residents with high levels of demonstrated financial need.

Virginia Guaranteed Assistance Program: Grants of up to the cost of tuition and fees are awarded by Virginia Tech from funds administered by the State Council of Higher Education for Virginia. Awards are made to selected undergraduate residents of Virginia with demonstrated financial need. Entering freshman must have a 2.5 high school grade point average and continuing students must have a 2.0 for renewal.

Commonwealth Award: Awards are made by Virginia Tech from funds administered by the State Council of Higher Education for Virginia for this need-based award to Virginia residents, seeking a first bachelor's degree as undergraduate students. Students must maintain a 2.0 GPA for renewal of this award in addition to demonstrated financial need.

Virginia Transfer Grants: Virginia Transfer Grants vary in amount up to $1,000 and are administered by the State Council of Higher Education for Virginia for undergraduate minority state residents who transfer from a community college with a 2.0 or better grade point average after completing a minimum of 45 credits of transferable college-level work.

University Programs

Academic Scholarships and Grants: The university awards a number of merit scholarships to selected undergraduate students who have established outstanding academic records, including incoming freshmen. All of the colleges and many departments within the university also award scholarships. No application is necessary for university-wide awards or for college or departmental awards, unless specifically requested. An electronic application is required for the General Scholarship Program and is available at www.finaid.vt.edu/.

Athletic Scholarships: Admission and enrollment of students who are candidates for financial aid for which athletic ability is a consideration shall be conditional upon compliance with applicable regulations of the Atlantic Coast Conference, and the National Collegiate Athletic Association.

War Orphans' and Senior Citizens' Benefits:

Every consideration is given qualified applicants entitled to benefits authorized under the Veterans' Readjustment Act of 1966 and the War Orphans' Education Assistance Act. Applications and information on veterans' benefit programs may be obtained from the nearest regional office of the Veterans' Administration. Students must enroll for a minimum of 12 credits each term to receive benefits as full-time students.

Under the Virginia War Orphans' Education Act, a child, not under 16 and not over 25 years of age, of a deceased veteran or of a veteran with a total disability resulting from wartime service (subsequent to December 6, 1941) may receive free tuition while in attendance at a state-supported institution of higher education.

The parent(s) must have been a citizen of Virginia at the time of entering such armed service, or be or have been a citizen of Virginia for at least ten years immediately prior to the date on which the child's application for admission was submitted to a state-supported institution of higher education; or, if deceased, the parent(s) was a citizen of Virginia on the date of his or her death and had been a citizen of Virginia for at least ten years immediately prior to his or her death. The Director of the Division of War Veterans' Claims shall determine the eligibility of the child who makes application for such benefits, and will notify the state-supported institution of higher education of approved benefits under this Act.

On a space-available basis, in accordance with Virginia law, Virginia residents 60 years or older may register for and attend courses without payment of university fees. Senior citizens also may audit courses. Details may be obtained from the Undergraduate Admissions Office.

Veterans Affairs Educational Benefits (GI Bill): Applicants who wish to receive VA Educational Benefits should contact the Office of the University Registrar or visit www.registrar.vt.edu.

Additional Information

Additional information on financial aid and scholarships may be obtained by writing, calling, or visiting:

Office of University Scholarships and Financial Aid
200 Student Services Building
Virginia Tech
Blacksburg, VA 24061
540/231-5179
Fax: 540/ 231-9139
E-mail: finaid@vt.edu

All information is correct at the time of publication. Current information is available from our website.

Financial Information

Refunds

- Policy
- Housing and Dining
- Tuition

Refund Policy

Refunds for excess financial aid or overpayments on accounts will be deposited directly to the bank account provided by the student if the student has enrolled in direct deposit. The student can enroll in direct deposit online through Hokie SPA under the Student Account information link. If the student has not provided bank account information to the Office of the University Bursar, all refunds will be mailed to the student's permanent address listed on Hokie SPA at the time the refund is processed. Refund checks will NOT be distributed at the Bursar's Office Customer Service windows. The student can receive the refund faster by having the refund deposited directly to a bank account. If the student chooses not to have direct deposit, it is critical the permanent address listed on Hokie SPA is correct. **Failure to do so will result in a delay in receiving the refund. Requests for replacement refund checks will not be accepted by the Bursar's Office until 14 calendar days after the date the check was issued. The student will be required to request a refund check replacement form from the Bursar's Office which will need to be completed, signed, and returned to the Bursar's Office to initiate the replacement of a refund check.** Delays in receiving a refund can be avoided by enrolling in direct deposit so the refund can be sent directly to the student's bank account.

Housing and Dining Refunds

Students holding a residence hall contract or a board plan who leave the university during the first week of class will forfeit $100 of their residence hall fee and $100 of their board fee. Thereafter, the semester room charge, less $100, will be apportioned over the first six weeks of the semester. A student who withdraws after the beginning of the seventh week of the semester will be charged the full room and board rate. Any eligible refund accrual is based on the room check-out date.

Students who purchase a declining balance dining plan will be charged a forfeiture fee of $100 during the first week. Beginning in week two and throughout the remainder of the semester, students will forfeit the base cost and will be refunded any unused dollars in the declining balance account.

Unused cash Dining Dollar deposits will be refunded in total for meal plan holders. Students who have only a Dining Dollars account and not a meal plan will receive the balance of all cash deposits minus $15. Questions concerning adjustments to room charges should be directed to Student Programs at (540) 231-2660. Questions concerning adjustments to meal plan charges should be directed to the Hokie Passport Office at (540) 231- 5121.

Tuition Refund Policy

The refund schedules below list the possible student refund for withdrawals, resignations, and reduced course load. Students considering reducing their course load or resigning should always review examples of the calculation of any refund on the Bursar's website at www.bursar.vt.edu before actually dropping the course or resigning. Students receiving financial aid should contact the University Scholarships & Financial Aid Office prior to dropping the course to determine the impact on their financial aid Students may or may not be entitled to a refund for courses dropped after the last day to add courses for a term. Tuition refunds for resignations are based on the effective date of resignation as determined by the student's associate dean. If there is a question related to the effective date of resignation, the student should contact the associate dean of their college.

Fall and Spring Semesters	
Tuition Refund Schedule for Reduced Course Loads	
Semester Class Day	**Student Refund**
One through five	100% of Tuition and Fees
Six through eight	90% of Tuition ONLY
Nine through nineteen	50% of Tuition ONLY
Twenty through thirty-seven	25% of Tuition ONLY
After day thirty-seven	0%
Tuition Refund Schedule for Withdrawals & Resignations	
Semester Class Day	**Student Refund**

- All refunds will be calculated from the official date of resignation, which may not necessarily be the last day of class attendance.

One	100% of Tuition and Fees
Two through eight	90% of Tuition ONLY
Nine through nineteen	50% of Tuition ONLY
Twenty through thirty-seven	25% of Tuition ONLY
After day thirty-seven	0%

Summer Terms

Tuition Refund Schedule for Reduced Course Loads	
Semester Class Day	**Student Refund**
One through three	100% of Tuition and Fees
Four through eight	50% of Tuition ONLY
Nine through fifteen	25% of Tuition ONLY
After day fifteen	0%

Tuition Refund Schedule for Withdrawals & Resignations	
Semester Class Day	**Student Refund**
One	100% of Tuition and Fees
Two through three	90% of Tuition ONLY
Four through eight	50% of Tuition ONLY
Nine through fifteen	25% of Tuition ONLY
After day fifteen	0%

- No refund will be granted for a resignation that occurred in a previous fiscal year.
- The Academic Fee, Technology Fee, Capital Fee and Comprehensive Fees are non refundable and no reduction will be made after the first day of classes for resignations and after the first 5 days of classes for reduced course loads.

- Academic Common Market Programs
- Auditing
- Billing Address
- Budget Tuition Plan
- Bursar's Office
- Collection of Past Due Receivables for Students
- Eligibility for In-State Student Tuition Privileges
- Enrollment Status, Full-Time
- Fees, Cooperative Education Program
- Fees, Late Payment
- Fees, Reinstatement
- Fees, Summer School
- Financial Aid
- Financial Aid Programs
- Medical Resignations
- Payment Information
- Payment Directions
- **Refund Policy**
- **Refunds, Room and Board**
- **Refunds, Tuition**

Academic Policies

Academic Common Market Programs

Certain majors at Virginia Tech are included in the Academic Common Market (ACM) inventory. Students from participating states who are enrolled in an ACM major may be eligible for the in-state tuition rate, provided the student has applied for, and received, certification through his/her state Academic Common Market coordinator. Students should be aware that eligibility to participate in the ACM program is contingent on continued full-time enrollment and progress toward their approved ACM program. Students who do not maintain full-time enrollment and are not making progress toward their approved ACM program will not receive the in-state tuition rate and may be subject to retroactive charges. For additional information on ACM majors and eligibility, students may contact the Office of Undergraduate Admissions, the Office of the University Registrar, or visit http://www.registrar.vt.edu/records/common_market.php.

Academic Eligibility Policy

Continued enrollment at Virginia Tech is a privilege that is granted as long as the student is making satisfactory progress toward a degree, maintenance of the required minimum grade point average, and compliance with all regulations stipulated in the *University Policies on Student Life*.

The minimum standard for good standing is eligibility to enroll. The required minimum grade point average is 2.00. Academic probation is imposed when the cumulative Grade Point Average (GPA) is less than 2.00; academic probation is lifted when cumulative GPA is at least 2.00. Academic performance will be reviewed at the end of each regular semester (fall and spring).

A student on **probation:**

1. may take no more than 16 credits per semester;
2. may be required (at the discretion of individual colleges) to consult with an advisor before beginning a probationary semester, and to sign an academic contract acknowledging his/her performance is not meeting university standards and stating what actions she/he is committed to taking to improve performance.

First suspension will be imposed whenever one of the following occurs:

1. A student on academic probation has a cumulative GPA less than 2.00 for the first 2 semesters (fall, spring) of enrollment; or
2. A student has 2 consecutive semesters thereafter with a cumulative GPA below 2.00.

First Suspension (Fall): A student who is placed on first academic suspension at the end of fall semester will be suspended from continued enrollment through the end of the following spring semester. **Note:** Students placed on first academic suspension at the end of fall semester are eligible to return the subsequent first summer, second summer, or fall semester.

First Suspension (Spring): A student who is placed on first academic suspension at the end of spring semester will be suspended from continued enrollment through the end of the following fall semester. **Note:** students placed on first academic suspension at the end of spring semester may NOT enroll in the immediately following summer session.

A student must earn a minimum 2.00 semester GPA the first semester back and raise the cumulative GPA to at least 2.00 by the end of the second semester back or earn a 2.50 GPA for every semester following the suspension until cumulative GPA is 2.00 or greater. A student will be placed on **second academic suspension** for failure to meet returning performance requirements.

Second Suspension (Fall): A student who is placed on second academic suspension at the end of fall semester will be suspended from continued enrollment through the end of the following fall semester. **Note:** students placed on second academic suspension at the end of fall semester may NOT enroll in the immediately following summer session.

Second Suspension (Spring): A student who is placed on second academic suspension at the end of spring semester will be suspended from continued enrollment through the end of the following spring semester. **Note:** students placed on second academic suspension at the end of spring semester may NOT enroll in the immediately following summer session. The same returning performance requirements apply for second suspension as for first suspension.

Final Suspension: A student will be permanently dismissed for failure to meet returning performance requirements after a second academic suspension.

Accreditation

Virginia Tech is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award doctorate, masters, baccalaureate and associate degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of Virginia Tech.

- Program accreditation within the various colleges of the university as follows:

American Assembly of Collegiate Schools of Business
Accreditation Association of Marriage and Family Therapist
Accreditation Commission for Programs in Hospitality Administration
Accreditation Board for Engineering and Technology
American Chemical Society
American Council for Construction Education
American Association of Family and Consumer Sciences (all undergraduate programs)
American Psychological Association (Clinical Psychology or Ph.D. program level only)
American Society of Landscape Architects (B.LArch. only)
American Society of Planners
American Veterinary Medical Associations Council on Education
Commission on Accreditation for Dietetics Education, American Dietetics Association
Foundation for Interior Design Education and Research
National Association of Schools of Theatre (B.A. and M.F.A. degree programs)
National Architectural Accrediting Board
National Council for Accreditation of Colleges of Teacher Education
National Institute of Food Technologists lists the Department of Food Science and Technology as one of 40 departments in the U.S. and Canada offering this
Society of American Foresters
Society of Wood Science and Technology
Virginia State Department of Education

Applying for Your Degree

Undergraduate students who satisfy graduation requirements for two curricula concurrently may request recognition of the second major on their transcripts; however, only the primary major will appear on the diploma.

Students may earn a second bachelor's degree (and diploma) by earning a minimum of 30 additional credit hours in residence with a minimum 2.0 GPA on all work attempted. All specific requirements must be met for each degree program, including attainment of the 2.0 GPA for all courses in the major. Note: threshold for total number of pass/fail hours allowed is based on minimum hours required for first degree.

All students must apply for a degree during the first semester of their junior year. The application for degree can be found on Hokie SPA under the Degree Menu. Once students have completed the application, they should generate a Degree Audit Report (DARS). This report can be generated through the Hokie Spa. The DARS report will help students to be fully aware of all degree requirements which remain to be completed.

Traditionally, degrees are conferred upon candidates who are present to receive them at the Commencement ceremony in May. Candidates may have their degrees conferred in absentia if they cannot be present at Commencement. To arrange for this, a candidate must indicate to the University Registrar either via Hokie SPA or in writing to be excused from the Commencement ceremony.

In addition to the traditional Commencement, other "Degree Conferral Dates" have been established for each May to May year. The degree conferral dates for fall, first summer, and second summer appear on the diplomas of qualified graduates. The degree conferral dates fall on the last day of final examinations (last day of term) for first summer session, second summer session and fall semester. Names of Graduates of Summer and Fall terms will appear in the Fall Commencement Ceremony Program only.

No commencement ceremonies are conducted at the end of the summer sessions, but graduates may attend the fall ceremony after completion of degree requirements. They may also request permission from the department to "walk through" the spring Commencement ceremony based on established departmental or college guidelines. Diplomas are not distributed.

Completion of degree requirements is determined after the final grade reports are available. Degrees are regarded as having been conferred on the appropriate conferral date upon determination by the University Registrar that degree requirements have been met. All course enrollments and attendance obligations must have been completed on or before the degree conferral date.

With the exception of spring, diplomas for all other "Degree Conferral Dates" are ordered after course work completions are established. Diplomas are distributed either by mail or in person to graduates who appear in the Office of the University Registrar, or at the next Commencement ceremony, if available.

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Center for Academic Enrichment and Excellence

www.caee.vt.edu
(540) 231-5499

The Center for Academic Enrichment and Excellence supports Virginia Tech's mission to expand students' personal growth and opportunities, advance social and community development, provide outreach and support services to under-served populations, and improve the quality of life by providing holistic support to our undergraduate students through a network of programs and services that includes:

- College Transition Programs to help freshman and transfer students make a successful transition from high school to college as well as facilitate academic and social adjustment to Virginia Tech;
- Learning Assistance Programs to help students who want to improve their academic and non-academic skills such as time management, study skills, and networking skills; and
- Academic Excellence Programs to help students who are already academically successful further enrich their educational experiences.

The Center for Academic Enrichment and Excellence strives to empower students to become life-long learners and contributing members of society, and to facilitate Virginia Tech's successful achievement of an institutional climate that is supportive of student success.

Combination Degrees

The bachelor's degree will be awarded to a student who has satisfactorily completed three years of undergraduate work in an appropriate curriculum and the first year of work in an accredited medical, dental, veterinary, or law school, or medical technology program (biology majors only), or physical therapy program (biology majors only), provided the student fulfills the requirements for the three-year program as follows:

- At least two of the three years of pre-professional work, including the third year, in residence at the university.
- A minimum of 90 semester hours undergraduate work, i.e. pre-professional school credit.
- Curriculum for Liberal Education requirements plus 18 of the 30 hours required in the major during the three-year, pre-professional work program. A department may require more than 18 hours of course work in the major.

Degree Programs

Virginia Tech offers four-year degree programs leading to a bachelor of arts, science, or fine arts degree. Also offered are five-year bachelor of architecture and bachelor of landscape architecture programs. Virginia Tech also offers graduate work in 63 fields of study leading to master's degrees and in 51 fields leading to the doctorate. The professional doctor of veterinary medicine is offered through the Virginia-Maryland Regional College of Veterinary Medicine, located at Virginia Tech.

Education Abroad

Virginia Tech sponsors education abroad programs in many countries around the world. These programs provide opportunities for students in almost every discipline.

The university's Center for European Studies and Architecture (CESA) in Switzerland, provides a unique place for undergraduate students to live and study. Curriculum for Liberal Education courses and specialized programs in architecture and in business are offered at CESA.

Students study for one semester in the university's center in the small town of Riva San Vitale, Switzerland, and make field trips to other European sites to complement their classroom studies. Semester long programs are also available in Punta Cana, Dominican Republic.

Semester/academic year programs are also available through exchange programs and other study abroad providers. There are over 100 universities in 40 different countries to choose from. Some of the more popular locations are Australia, France, Italy, Germany, Ecuador, and the United Kingdom, to name a few. VT students who participate in bilateral and ISEP student exchange programs pay the same tuition and fees that they would pay for a regular term at VT. Virginia Tech's summer faculty-led programs enroll the greatest number of students. Tech has summer options in more than 25 countries, ranging from Australia to South Africa, and lasting 2-8 weeks. A Virginia Tech faculty member runs each program, and students will be enrolled in Tech courses.

Students who plan to study abroad should discuss the transfer of credits earned with their academic dean prior to leaving the Virginia Tech campus. All credits to be transferred to this university for use toward degree completion should be approved before they are taken. This is particularly true of courses completed in foreign universities for which there is no Virginia Tech equivalent.

Most forms of financial aid may also be applied to education abroad programs, and there are several scholarships and grants available. We encourage students to contact the Office of Scholarships and Financial Aid as soon as they consider studying abroad.

For more information about education abroad opportunities, contact the Education Abroad Office at 526 Prices Fork Road, Room 131, or consult this website: www.educationabroad.vt.edu.

Field Study, Independent Study, Special Study, and Undergraduate Research

Virginia Tech offers several types of courses that can be tailored to the needs of individual students or specific groups of students. Students develop a plan of work to reach particular objectives, obtain approval of both the department and a faculty member who will supervise the work, and work with them to arrange hours and credits.

By allowing students to pursue topics in which formal courses are not available, these programs provide greater academic flexibility for undergraduate students at Virginia Tech. They also provide students an opportunity to assume a greater share of the responsibility for their own education, outside the traditional classroom environment.

Students must submit an official approval form prior to registration. In most cases, the student's first contact for an independent study, field study, or undergraduate research course is the department offering the course. Registration is through the student's dean's office. Special study courses are set up by the department, and the student registers through web course request. Some colleges and departments have restrictions on eligibility to register for these courses, and limit the number of hours that can be used toward graduation.

Field Study (X964) courses are work experiences approved by some departments and are selected to augment traditional classroom activities. The student is evaluated on the knowledge and skills acquired as a result of the experience. Emphasis is placed on the academic and practical value of the work.

Independent Study (X974) courses generally involve extensive reading and tutorial sessions with the faculty supervisor and also may involve written papers. The subject of Independent Study usually is a continuation in greater depth of a topic covered in a regular course, allowing students to study topics of particular individual interest.

Special Study (X984) courses are designed for a group of students, rather than for a single individual. This type of course may be used to study a timely topic, one in which there is current, but not necessarily lasting, interest. It also may be used to launch an experimental course before the course is incorporated into the regular curriculum.

Undergraduate Research (X994) courses are individual research projects carried out by students under faculty supervision. The student defines the research topic, proposes a methodology, carries out the research, and writes a report.

Graduation Requirements and Degree Conferrals

A student must complete all courses with at least a minimum 2.0 GPA for all hours attempted. In addition, a student must present an equally satisfactory record in courses attempted in the major and/or any minor. The number of credit hours required varies from one major curriculum to another. Virginia Tech reserves the right to modify requirements in the student's program if necessary. The approved requirements in effect for a student's graduation in a given calendar year apply. Said requirements must be approved two years prior to their effective graduation date. All students earning degrees from Virginia Tech must have earned a minimum of one-fourth of the credit for their respective degrees from this institution. The senior year, with a minimum of 27 hours, must be completed in residence, or 27 of the last 45 hours must be completed in residence, provided that only approved courses taken *in absentia* are transferred to complete requirements.

Language Study Requirement

By the time they graduate from the university, students must meet a language study requirement. The minimum requirement may be met in high school by completing 2 units of a single foreign or classical language. Some majors in the College of Liberal Arts and Human Sciences may require 3 units. The requirement also may be met after admission by one of the following:

1. Earning six (6) semester hours of college-level foreign or classical language credit or American Sign Language. Such credits are in addition to that number normally required for graduation in a student's program of study.
2. Receiving credit by examination for a foreign or classical language or American Sign Language. The credit by examination option is available only to students who have gained knowledge of a foreign language without the benefit of formal training. This privilege is intended to recognize informal non-academic learning experience and is **not** offered to a student who has had regular classroom instruction in that foreign language. (Contact the Department of Foreign Languages and Literatures for more information.)

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Honor Code and Honor System

The Virginia Tech Honor Code is the university policy that defines the expected standards of conduct in academic affairs. The Honor System is the university student body charged with disseminating information about the Honor Code to the university community and enforcing the Honor Code.

Violations of the Honor Code in academic affairs include, but are not limited to, the following:

1. **Cheating:** Cheating includes the actual giving or receiving of any unauthorized aid or assistance or the actual giving or receiving of any unfair advantage on any form of any academic work, or attempts thereof.
2. **Plagiarism:** Plagiarism includes the copying of the language, structure, ideas, and/or thoughts of another and passing off same as one's own original work, or attempts thereof.
3. **Falsification:** Falsification includes the statement of any untruth, either verbally or in writing, with respect to any circumstances relating to one's academic work, or attempts thereof. Such acts include, but are not limited to, the forgery of official signatures, tampering with official records, fraudulently adding or deleting information on academic documents such as add/drop requests, or fraudulently changing an examination or other academic work after the testing period or due date of the assignment.

A student who has doubts about how the Honor Code applies to any graded assignment is responsible for obtaining specific guidance from the instructor before submitting the assignment for evaluation. Any student accused of an alleged violation of the Honor Code is guaranteed certain basic rights, including being considered innocent until proven guilty. The complete "Constitution of the Honor System" is available from the Honor System Office (207 West Roanoke St.) and is posted on the Virginia Tech home page at www.honorsystem.vt.edu.

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Pre-Professional Preparation

Pre-Medical Advising

The university maintains an office for Pre-Medical Studies Advising, located in Hillcrest Hall. The office functions within the Honors Program, but enrollment in the Honors Program is not a prerequisite for consultation with Pre-Medical Studies advising services.

It should be noted that although the majority of pre-medical and pre-dental students major in a science, any major is acceptable to medical and dental schools so long as certain specific admission requirements are satisfied. Thus pre-medicine is an interest rather than a degree program. Medical schools encourage students interested in medicine to pursue broad undergraduate study in the humanities and social sciences as well as biology and the natural sciences. The national standardized Medical College Admission Test (MCAT) emphasizes facility with scientific problem-solving, critical-thinking and writing skills as well as mastery of basic biology, chemistry and physics concepts. Additional requirements include significant participation in volunteer health care activities, letters of evaluation, and an interview at the medical school. Successful candidates exhibit high levels of scholastic achievement and intellectual potential as well as motivation and humanistic concern.

The Pre-Medical Studies Advising office provides direct counseling and assistance to students about careers in medicine, dentistry, and other health professions, preparing for application to medical or dental schools, and the admission process. A course, "Careers in Medicine," is available to students at the sophomore and higher level. After gaining individual volunteer experience, a limited number of students may be placed with local physicians for a one-semester two-credit preceptorship. Upon request, this office will also provide interviews and letters of evaluation.

Core course requirements vary somewhat among the accredited United States medical schools, but most require 2 semesters each of mathematics, English, biology (with lab), general chemistry (with lab) organic chemistry (with lab), general physics (with lab), and most require a semester with biochemistry. The MCAT is also required at most medical schools. Specific entrance requirements are listed in the book Medical School Admission Requirements: United States and Canada.

The general requirements for most dental schools are the same as those listed above for medical school. The standardized Dental Admission Test (DAT) is required by most dental schools.

Pre-Law Advising

Law students and lawyers come from many undergraduate backgrounds, and the skills necessary to succeed in law school and as an attorney can be developed in a variety of courses across a range of disciplines. Law schools do not treat any specific course or major as a prerequisite for admission, nor do they look with special favor on applicants who have graduated from a formal "pre-law" program. Accordingly, Virginia Tech does not offer a formal pre-law major. The university does offer a top-quality education in a large number of fields, as well as counseling about law as a career, preparing for and applying to law schools, and the law school admission process. Students are encouraged to maintain contact with the University pre-law advisors, the Office of Career Services, and others on campus with information about legal careers.

For further information on pre-law studies at Virginia Tech, including how to contact the University pre-law advisors, see the following website: http://www.psci.vt.edu/prelaw/index.html.

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Restricted Majors and Programs

Students should be aware that there are some academic majors and programs within the university that have strict entrance requirements or are in such high demand that they cannot accommodate all who wish to enter them. Administrators of these restricted programs must be selective in allowing students to transfer in from other majors within the university and in permitting second majors or minors. Students seeking entrance into such restricted programs should consult the appropriate department.

Restricted programs for internal transfers are as follows:

College of Agriculture and Life Sciences
Human Nutrition, Foods and Exercise

College of Architecture and Urban Studies
Architecture
Art & Art History -- Visual Communication Design; Studio Art
Industrial Design
Interior Design

Pamplin College of Business
Accounting and Information Systems
Business Information Technology
Finance, Insurance & Business Law
Management
Marketing

College of Engineering
All majors

College of Liberal Arts and Human Sciences
Communication
Music
Political Science and International Studies

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Selecting or Changing a Major, Double Major, or Minor

Undergraduate students must be enrolled in their major(s) [and minor(s)] of choice prior to the beginning of their senior year, or by the time they have 30 semester hours to complete before their graduation. Students seeking double majors must be accepted into the second major by the academic department before the university can award the second major.

Changes from one degree program to another (i.e., changes in major) or the addition of a second major or a minor usually can be accomplished at any time prior to the senior year, simply by working with one's academic advisor and informing the head(s) of the department (s) and the dean(s) of the college(s) in question. A major (or second major) cannot be selected after the beginning of the senior year. (See section above on Selecting a Major.)

Minors are offered by many academic departments. Refer to the section on Graduation Requirements and Degrees and to the appropriate academic department in the college chapters of this catalog to review the requirements for a minor.

Students should be aware that changes in their, such as changing or adding majors or minors, sometimes imply extra course work, which

can delay graduation.

Twenty-five percent of the student's total hours must be taken at Virginia Tech.

Procedures to Follow When Changing or Adding a Major or Minor

Students should submit their applications for changing majors or adding minors two weeks prior to the start of each semester's registration period. This will allow students adequate time to assess their situations before deciding to transfer and registering for the following term.

The procedure for changing majors or adding a minor is as follows:

1. Request an "Application for Change in Curriculum" from the office of the dean of your new curriculum.
2. Follow the instructions given on the "Application for Change in Curriculum" form.

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Selection of Studies

The regular academic year at Virginia Tech is divided into two semesters, fall and spring. Virginia Tech also offers two summer sessions. Most courses of study require eight (8) terms (i.e., semesters and/or summer sessions) for completion of the bachelor's degree requirements. Completion of the degree requirements for those students who enroll in the Cooperative Education Program, Bachelor of Architecture Program, or Bachelor of Landscape Architecture Program requires five years.

Elective courses are chosen through consultation with the student's advisor. The dean of the college in which a student is registered has authority in such matters as substitution of courses, dropping and adding courses after deadlines, or permission to take an overload.

Students have the assistance of faculty guidance, introductory courses, and special counseling to help them choose wisely which course of study they should take. Every effort is made to assure that all courses listed under the various department of instruction will be offered. Virginia Tech reserves the right, however, to withdraw any course for which an adequate number of students do not enroll.

Student Responsibilities Regarding Satisfactory Progress Towards Degree

It is the student's responsibility to satisfy all course requirements as established by the faculty teaching the courses in which s/he is enrolled. It is also the student's responsibility to be aware of all major, degree, college, and graduation requirements necessary to complete his or her. Students are also responsible for satisfying all university, college, and departmental requirements for progress towards degree. (See this chapter for university requirements; consult the departmental listings in this catalog for major requirements.)

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Student Responsibilities Regarding Official Student Records

Students are responsible for keeping and being familiar with their own records and for the accuracy of these records.

A student's failure to keep his/her address updated does not absolve the student of responsibility for matters which require notification by the university. Changes to your local address, permanent address, or parent/guardian address should be promptly updated by accessing Hokie SPA. Correct dorm addresses are established through the Student Housing Office in Eggleston Hall. If you are not sure what addresses are on file, you may check Hokie SPA for verification.

It is the student's responsibility to check his/her current schedule of classes by accessing Hokie SPA. Errors must be corrected by the established deadline stated in the *Timetable of Classes*. Request for course(s) will result in a responsibility for payment of tuition and fees. It is the student's responsibility to complete and return the Withdrawal/Resignation form by established term deadlines if choosing to disenroll for a given term.

Students are responsible for seeing their advisors during course request week so as to assure appropriate curricula planning.

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Teacher Education at Virginia Tech

Email: edinfo@vt.edu
Website: http://www.soe.vt.edu

Virginia Tech offers teacher education leading to endorsement in 25 fields of study. All teacher preparation programs are at the graduate level. Students seeking a teaching license should consult the School of Education Office of Academic Programs website (http://www.soe.vt.edu/oap/index.html) for details on specific programs of interest.

The School of Education is accredited by the National Council for Accreditation of Teacher Education, and all programs are recognized by their national specialized professional associations and approved by the Virginia Board of Education. Graduates may qualify, through reciprocity agreements with Virginia, for a teaching license or endorsements in many other states.

Undergraduate students who anticipate applying for a master's degree in teacher education should consult an advisor in the Office of Academic Programs (edinfo@vt.edu) or the academic advisor in their undergraduate major. Decisions about entering graduate programs in teacher education should be made early in the undergraduate years so that an appropriate major can be selected prior to applying for a teacher education program. Seniors with a GPA of 3.0 or better may dual enroll in their last semester to take graduate-level education courses. Credits earned under dual enrollment may be applied to licensure or degree requirements with the permission of the graduate advisory committee.

Applicants for teacher education programs must submit passing scores on Praxis I: Academic Skills Assessments or acceptable scores on the SAT or ACT prior to acceptance into the School of Education. Passing scores on relevant Praxis II: Specialty Area Tests, the Virginia Communication and Literacy Assessment, and the Virginia Reading Assessment (for reading specialists and elementary education teachers) are required prior to receiving a teaching license. A criminal record check is required by school divisions in Virginia prior to employment.

Notable features of the teacher education program at Virginia Tech are:

- graduates with a commitment to learning and advocacy for all children
- a faculty devoted to improving education through research, teaching, and outreach
- an emphasis on science, math, and technology within a comprehensive School of Education
- graduates with expertise in content fields and related pedagogical knowledge and skills
- committed clinical supervisors in schools
- field experiences and internships in diverse school settings
- the latest instructional technologies
- a strong demand for our graduates

Applications for teacher education programs may be submitted on line through the Graduate School website: http://www.grads.vt.edu/

Undergraduate Courses of Study

Undergraduate courses of study leading to bachelor's degrees at Virginia Tech are listed below. In addition, many options and specialties pertaining to each academic college are described in the individual college chapters in this catalog.

- **College of Architecture and Urban Studies**
  Art and Art History
  Architecture
  Building Construction
  Environmental Design & Planning
  Industrial Design
  Interior Design
  Landscape Architecture
  Governmental & International Affairs
  Public Administration and Policy
  Urban Affairs and Planning
- **College of Agriculture and Life Sciences**
  Agricultural and Applied Economics
  Agricultural and Extension Education
  Animal and Poultry Sciences
  Biochemistry
  Biological Systems Engineering
  Crop and Soil Environmental Sciences
  Dairy Science
  Entomology
  Environmental Science
  Food Science and Technology
  Horticulture
  Human Nutrition, Foods, and Exercise
  Plant Pathology, Physiology, and Weed Science
- **College of Engineering**
  Aerospace and Ocean Engineering
  Biological Systems Engineering
  Chemical Engineering
  Civil and Environmental Engineering
  Computer Science
- **College of Liberal Arts and Human Sciences**
  Air Force ROTC
  Apparel, Housing, and Resource Management
  Army ROTC
  Communication
  Educational Leadership and Policy Studies
  English
  Foreign Languages and Literatures
  History
  Human Development
  Interdisciplinary Studies
  International Studies
  Music
  Navy ROTC
  Philosophy
  Political Science
  Science and Technology in Society
  Sociology
  Theatre Arts
  Teaching and Learning
- **Pamplin College of Business**
  Accounting and Information Systems
  Business Information Technology
  Economics
  Finance, Insurance, and Business Law
  Hospitality and Tourism Management
  Management
  Marketing
- **College of Natural Resources**
  Fisheries and Wildlife
  Forestry

Electrical and Computer Engineering
Engineering Education
Engineering Science and Mechanics
Industrial and Systems Engineering
Materials Science and Engineering
Mechanical Engineering
Mining and Minerals Engineering

Geography
Wood Science and Forest Products

- **College of Science**

Biological Sciences
Biochemistry
Chemistry
Economics
Geosciences
Mathematics
Physics
Psychology
Statistics

Note: Students seeking teaching licensure in English, history and social sciences (geography, political science, and economics), mathematics, chemistry, biological sciences, physics, earth science, theatre arts, music, foreign languages, and English as a second language should contact the Center for Teacher Education. For elementary education, see interdisciplinary studies, human development, or contact the Center for Teacher Education.

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University Enrollment and Academic Progress

Registration Procedures

1. Registration for continuing students is an eight-day period in the middle of each semester during which currently enrolled students may select classes for the next semester. During spring semester, students register for summer school (if they plan to attend) and for fall semester classes.

    a. The student consults with his/her **departmental advisor** about courses to be taken. Both should be aware of such considerations as the student's current GPA, the course load in hours and in effort required, pre- and co-requisites for courses so limited, the student's relationship to the eligibility schedule, and fulfillment of College and Curriculum for Liberal Education (a.k.a. University Core Curriculum) requirements and those for major, minor, or cognate. If the student fails to meet with his/her advisor, a **hold** may be placed on their registration.
    b. When a schedule is agreed upon, the student enters the course requests by accessing Hokie SPA.
    c. **Overloads** (more than 19 hours per semester, or 7 each summer session) require permission of the student's academic dean. The student will be scheduled for the first available 19 hours (7 in Summer) requested.
    d. The student's **current class schedule** may be printed by accessing Hokie SPA; the student is then responsible for verifying that he/she is in fact enrolled in the courses and sections he/she has been attending.

2. Approximately three weeks after the close of registration week, course request results are available and may be printed by accessing Hokie SPA. The web class ticket will include detailed information regarding sections which are full, conflicting, withdrawn, or restricted which explains why these sections were not added to the student's schedule. See item number six (6) below for details about why a student's course selections are sometimes ignored, or why a student's schedule might be purged or held from registration.

3. Students may adjust their schedules on a space available basis using web DROPADD, an electronic schedule adjustment program. Students should consult with their advisors before making any changes except those for convenience (usually time). 1000-level Mathematics and English courses, because of the high demand, currently have restrictions on section changes. As a rule, any student who drops a 1000-level English or Math course via Hokie SPA or department will not be allowed to force-add another 1000-level English or Math course that term. A student should be aware that dropping below full-time status (12 semester hours) may jeopardize financial aid, campus housing, and graduation date.

4. A **Force-Add** form permits admission to a class **over** the desired enrollment threshold, but not over room capacity. This request is submitted via a "force-add" form **available in the department offering the course**, and requires the instructor's (or, in some departments, departmental) permission. **Force-adds are processed by the department offering the course. Caution: The force-add transaction permits enrollment in courses with conflicting times.**

5. **Late Adds and Drops Adjustments** to a student's schedule after the last date to carry out a specific transaction (see Hokie SPA for deadline dates) require permission of his/her own academic dean. Thus, a Business major wishing to late-drop an English course requires approval from the College of Business, not that of Liberal Arts and Human Sciences. A late-drop request based on mental or physical illness requires a recommendation from Student Health Services. Faculty cannot add or drop students from their rolls.

6. **Purged and Held Registrations** Failure to pay tuition bills by a posted deadline (usually by the end of the 2nd week of classes) may result in the student's schedule being **purged** (removed from the system). A schedule may be **held** (made inaccessible to department staff, as well as to students using DROPADD, thereby precluding transactions of any type) for nonpayment of fees other than tuition (e.g., parking tickets), for Honor Code violations, for academic ineligibility (due to department and/or academic suspension), or for failure to make progress toward a degree. This last hold is imposed by the student's dean, while all other holds are imposed by other offices. The student should check with the office imposing the hold, as only that office is authorized to remove the hold. **Billing is done by the Office of the University Bursar; contact the Bursar's Office if you have questions about your bill or do not receive a bill.**

Academic Policies

Family Educational Rights and Privacy Act of 1974

Buckley Amendment

To comply with the provisions of the Family Educational Rights and Privacy Act of 1974 (as amended), Virginia Polytechnic Institute and State University will not release education records or personally identifiable information contained therein, other than directory information, without the student's written consent.

Directory information at Virginia Polytechnic Institute and State University includes:

- student's name
- address(es)
- telephone number(s)
- major field of study
- whether a student is currently enrolled
- enrollment status (full-time, half-time, etc.)
- academic level and class
- anticipated date of graduation
- application for degree
- dates of attendance
- degree(s) earned, including date and level of distinction
- participation in officially recognized activities and sports
- weight and height of members of athletic teams

Directory information will be withheld upon the written request of the student. Such prohibition against release generally does not extend to record requests from other school officials at this institution who have an educational need to know, state and federal education authorities, courts or accrediting organizations. Questions concerning this policy may be referred to the Office of the University Registrar.

FERPA Disclosure

Due to the laws covering confidentiality, it is illegal for anyone to release information (grades, course enrollment, class schedule, standing) about any student to anyone without permission from the student. The Family Educational Rights and Privacy Act (FERPA) requires the student to authorize the university prior to release of any academic record information to a third party. Completion of the online form (Hokie SPA) allows the student to approve dislosure of his/her academic record information to parent(s) and/or guardian(s). The disclosure will remain valid until the student removes the authorization.

Tax Dependent? The Commonwealth of Virginia requires tax dependent students attending Virginia's colleges and universities to release academic record information to their parents. This requirement is allowable within the guidelines of FERPA. If the student is a tax dependent of his/her parent or guardian, please denote that information by checking "YES" in the question column, "Are you a Tax Dependent?" on the online FERPA disclosure form (Hokie SPA).

Notification of Rights under FERPA

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights include the following:

The right to inspect and review the student's education records within 45 days of the day the University receives a request for access. Students must submit to the Office of the University Registrar written requests that identify the record(s) they wish to

inspect. The university official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

The right to request the amendment of the student's education records that the student believes are inaccurate or misleading. They should write the University official responsible for the record, clearly identify the part of the record they want changed, and specify what is inaccurate or misleading. If the University decides not to amend the record as requested by the student, the University will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent. One exception which permits disclosure without consent is disclosure to school officials with legitimate educational interests or concerns of health and safety. A school official is a person employed by the University in an administrative, supervisor, academic or research, or support staff position (such as health staff); a person or company with whom the university has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Visitors; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

The right to file a complaint with the U.S. Department of Education concerning alleged failures by Virginia Tech to comply with the requirements of FERPA. The name and address of the office that administers FERPA is:

Family Policy Compliance Office
U.S. Department of Education
400 Maryland Avenue, SW
Washington, DC 20202-5920

The Family Educational Rights and Privacy Act indicates that students and former students should be granted the opportunity to change their names on education records upon the production of evidence showing that the name has changed. The following procedure applies to requests for changes to the name appearing on a student's education record:

- Complete Request for Change in Name form in the Office of the University Registrar
- Provide a photocopy of a Social Security card that reflects the new name and a valid drivers license or other form of photo identification
- Provide a photocopy of a birth certificate, marriage certificate or license, divorce decree, court order, or naturalization papers including certificate number, petition number, and registration number

Please note that all documentation used in support of this request should reflect the name for which you are requesting the change.

The Privacy Act of 1974 (U.S. Public Law 93-579, Sect. 7) requires that the university notify students that disclosure of a Social Security number is voluntary unless employed by the university or receiving federal financial aid. Pursuant to the 2003 State Code of the Commonwealth of Virginia, no student identification card may display the social security number as an identifier. Effective with students entering Fall 2003 and beyond, a generated identification number will be utilized as the default unique identifier. This generated number will be nine digits in length and will begin with the number, "9", nine. The generated student identification is defined as personally identifiable information by federal legislation, FERPA (Family Educational Rights and Privacy Act) (U.S. Public Law 93-579, Sect. 7), and is prohibited from disclosure except to education officials with legitimate educational interest.

For students who entered Virginia Tech prior to Fall 2003, the social security number was the default student identification number. Effective with the entering class of Fall 2003, a nine digit generated identifier is assigned to each student. Use this identifier when the student identification number is requested by a university official. Important note: disclosure of the social security number may be required by different university offices if required by the Code of the Commonwealth of Virginia or Federal statute.

Required Demographic Information

Virginia Tech policy requires annually the collection of specific demographic data for each student: emergency contact entry or emergency contact confirmation, and VT Alerts Opt In or Opt Out action. Students will be prohibited from registration until the information is provided.

Academic Policies

Grades, Grade Points, and Credit Hours

Course Withdrawal Policy

The Course Withdrawal Policy is intended to assist undergraduate students who find themselves enrolled in undergraduate level courses for which they are insufficiently prepared, or for those who initially enroll in majors that they subsequently change. Presidential Policy 196 allows currently enrolled students to designate a course status of "Course Withdrawn." A maximum of six (6) hours of undergraduate level coursework may be dropped beyond the normal six-week drop deadline date during a student's undergraduate academic career at Virginia Tech subject to the following stipulations:

1. This option may be exercised up through the Friday of the last full week of classes of each term, prior to a student's scheduled graduation.
2. Students must formally request to apply the Course Withdrawal to a course by the Friday of the last full week of the classes of each term. The deadline appears in the deadlines listing of the online Time Table of Classes.
3. Courses from which a student withdraws under the terms of this policy will appear on their transcript with a "W" grade, but will not count in the GPA hours nor in any GPA calculations. The "W" signifies that this policy was invoked and does not reach the rationale for its use. The reasons for use remain the student's responsibility.
4. A student decision to invoke this policy is irrevocable and unappealable.
5. Withdrawals under this policy may not be employed to reduce or obviate any penalty otherwise accruing to students under the University Honor System.
6. Students may request withdrawal from any course, irrespective of the evaluation earned in it up to the point of their request for withdrawal. However, if a registration hold exists at the time of application of this policy, the student must take action to remove the hold within five (5) working days of the application or the request will be voided. Students are responsible for resolving their registration holds with the appropriate university office.
7. Students already enrolled when this policy takes effect who have exercised their option to use the previously existing Freshman Rule shall not be eligible to use this policy.

To exercise this option, interested students should see their academic advisor to obtain a course withdrawal form and submit it to their designated departmental representative and academic dean for approval.

Credit by Examination

Credit, not to exceed 12 semester hours, may be allowed by special examination where exceptional command of a subject can be demonstrated in lieu of formal course work. This privilege is not available to a student who has previously audited or enrolled in the course, or has previously attempted credit by examination in the course. If credit by examination is deemed appropriate, the offering department shall have full responsibility for determining the type of examination to be given and what constitutes a passing grade.

Credit established by examination may not be used to satisfy the in-residence requirements for graduation, and no grades or quality credits will be assigned.

There is a per-credit fee for the examination. The current fee is $10.00 per credit hour and is subject to change at the beginning of an academic year. Only currently enrolled undergraduate students are eligible for special examinations allowing university credit. Official approval must be obtained from the head of the department offering the course.

Credit for ROTC Courses

In some majors, not all ROTC courses may be applied toward a bachelor's degree. Students should consult their approved major checksheet for specific information on which courses will count toward their degree.

Credit Hour System

Virginia Tech uses the credit-hour as its unit of credit. To earn one (1) credit-hour in a term, the student is expected to spend three hours each week in the classroom or laboratory, or in preparation and study for a course meeting. Thus, a one-credit lab course generally requires three hours of lab time per week and only a small amount of preparation (or none at all) outside the lab. But, in general, a three-credit course requires three hours in the classroom and about six hours of study and preparation weekly. Course descriptions under the departments of instruction (in the chapters on the various colleges) indicate the number of hours required in formal class and laboratory meetings per week and the number of credits received per term.

Dean's List

Undergraduate students who attempt at least 12 credit hours graded on the A-F option and who earn a 3.4 GPA for either spring or fall semester will be included on the Dean's List for that term. The Deans' Lists are not compiled for summer sessions. Any notifications or certificates indicating inclusion on the Dean's List for a particular term are issued by the student's academic dean.

Examinations

Final examinations are held at the close of each term according to a schedule established by the university. An instructor may not change the date or time of a final exam without the approval of the dean of the college. Students may request permission from their college dean to reschedule a final exam if they have conflicting exams or if they have three final exams in 24 hours. Otherwise, permission to reschedule a final exam is granted by the dean only in very unusual circumstances. Deferred final exams may be authorized only by the student's academic dean or by the Office of Student Health Services.

Re-examinations

Re-examinations are available only for students who are candidates for degree in the specific term.

After a term is over, a re-examination in one course in which the final grade earned is C- or below may be authorized if the student was enrolled in the course during the final term of his or her senior year and if a satisfactory re-examination in the course will qualify the student for graduation. The student must make the re-examination request to the dean and must complete the exam as soon as possible after the first examination.

For the student to be granted a re-examination, approval is required by the instructor, the student's department head, and the student's academic dean. In determining the validity of the student's request, consideration is given to class performance and completion of assigned work.

Grade Appeal Procedure

University policy states that the assignment of a grade is the sole prerogative of the instructor of the class. It is incumbent on the instructor to establish the criteria for grading in the syllabus that is distributed at the beginning of the term. All grades are to be based on established grading criteria and not on personal conduct or opinions unrelated to academic standards. A student may not do extra work to raise his/her grade. If a student feels that a grade has been calculated incorrectly or has been assigned in a prejudiced or capricious manner, the student should discuss the matter with the instructor. If discussion between the instructor and the student cannot resolve the issue, the student should appeal to the department/division head. In the unusual circumstance that resolution does not occur at the departmental/divisional level, the student may appeal to the college dean who will attempt to reconcile the matter by whatever mechanism seems most appropriate for that college and for that case. A grade appeal must be made by the student as soon as possible but no later than the end of the student's subsequent term of enrollment after the grade in question has been assigned.

Grades and Grade Points

The academic achievement of a student in a specific course is rated as follows:

Letter Grade	Grade Points for each hour
A (Excellent)	4.0
A-	3.7
B+	3.3
B (Good)	3.0
B-	2.7
C+	2.3
C (Fair)	2.0
C-	1.7

- A grade of "I" (incomplete) may be given when the requirements of a course other than the final examination have not been completed due to illness or extenuating circumstances beyond the student's control. The "I" grade is the prerogative of the instructor.
- To remove an "I" grade, lecture course requirements must be satisfied during the student's first subsequent term of enrollment, and laboratory course requirements must be satisfied prior to the end of the first term during which the course is offered and the student is enrolled. Incomplete and "X" grades are automatically converted to "F" if requirements are not fully satisfied during the period of time allowed.
- An "NR" grade is assigned automatically by the system when a student is enrolled for a class and no other grade is assigned by the instructor. The "NG" is intended to be a grade distinguishable from those initially assigned by the instructor and thus to indicate clearly the origin of the grade.
- Courses from which a student withdraws under the terms of the policy explained on the

D+	1.3
D	1.0
D- (Barely Passing)	0.7
F (Failure)	0.0
I (Incomplete)	---
NG (No Grade)	---
NR (Not Reported)	---
P (Passing)	---
RP (Repeated Course)	---
S (Satisfactory/credits only)	---
W (Course Withdrawn)	---
X (Continuing Course)	---

following page, will appear on their transcript with a "W" grade, but will not count in the GPA hours nor in any GPA calculations. The "W" signifies that this policy was invoked and does not reach the rationale for its use. The reasons for use remain the student's responsibility.

- The Grade Point Average (GPA) is computed by dividing the total number of quality credits earned by the total number of hours attempted at Virginia Tech, except courses passed on a Pass/Fail basis and courses with an "X" (Continuing Course). "NG" grades are computed as "F" grades in determining GPA. The GPA is unaffected by the "I" grade, unless or until the "I" is converted to an "F" for failure to complete the course requirements within the allotted time.
- A student may not repeat courses in order to improve his or "her grade average where a grade of "C or higher has been earned. An assigned grade of "A-D" will be changed to "P" whenever a graduation analysis (DARS report) detects a repeated course previously passed with a "C" or better.

Grades, Midterm

Midterm grades are produced for freshmen and transfer students whose first term of enrollment is fall semester. Beginning Fall 1996, students whose first term of enrollment is summer will also receive a midterm grade report during fall semester. "Satisfactory" is given for work earning a grade of C or better and "unsatisfactory" is given for work earning a grade of C- or below. The midterm grade is not part of the student's permanent academic record and is only intended to be an early indication of the student's progress.

Graduation Requirements, Hours Passed or Completed Toward

The "total credits" figure on the displayed grade report is **not** necessarily the same as the total hours passed which are effective toward graduation requirements. The latter must be assumed not to exceed the "total credits" figure.

Listed below are a few examples of typical situations yielding "pass" hours which must be subtracted to determine the total credits useful toward graduation requirements:

1. Transfer and/or advanced placement credits that have been subsequently duplicated by courses at Virginia Tech.
2. Credits earned at Virginia Tech that have been duplicated by repeating courses or taking courses ruled to have duplicating credit.
3. Transfer credits allowed from a two-year college that are in excess of one-half of the total credit hour requirement for the curriculum.
4. Credits for **Physical Education Service Activities** courses (now listed under HNFE), which exceed a total of two, the maximum allowed toward a bachelor's degree.
5. Credits for military science that exceed the total specified by the college for the student's curriculum.
6. Credits on the pass/fail grading system that exceed 10 percent of the credits **completed at Virginia Tech** in the student's degree program.
7. Credits for courses that do not count towards the degree, (e.g. EDCI 1004).

Obsolete Academic Records, Evaluation of

Under the "Obsolete Academic Records Policy," former Virginia Tech students returning to the university after an absence of at least five years may request in writing to have their academic records evaluated by the appropriate academic dean. Such transcripts will be evaluated in the same manner that transfer student transcripts are considered; credits will be allowed only for those courses appropriate for the degree. The grades for these allowable courses will not be factored into the student's GPA, but all courses will remain part of the student's permanent record.

Pass/Fail System

A limited pass/fail (P/F) grading system is available to encourage students to enrich their academic programs and explore more challenging courses outside their majors, without the pressures and demands of the regular grading system. The P/F grading option is available to all undergraduates who have completed a minimum of 30 credit hours at Virginia Tech and have a cumulative GPA of 2.0 or above. These restrictions do not apply to courses that are only offered P/F. **No required course or course used for the Curriculum for Liberal Education may be taken on a "P/F" basis (unless only offered on a P/F basis).**

Under the pass/fail system students are allowed to take ten percent of the total number of credits required in their degree program on a pass/fail basis. The number of credits allowed under the pass/fail system is based on the course work completed at Virginia Tech. Since the ten percent limit for pass/fail courses is based on work completed at Virginia Tech, transfer credit may not be used in establishing these limits. The number of pass/fail credits allowed is based on the number of credits required by the student's first degree program, only. Additional degree programs may not be used to increase the number of pass/fail credits that a student is permitted to use toward any degree. No more than two courses per term may be taken P/F, excluding physical education activity courses and required courses offered on a P/F basis only.

Under the P/F grading system, a "P" is granted for earning a "D" or better in the course; otherwise, an "F" is given. A "D-" is a failing grade under the P/F option. The "P" or "F" is recorded on the student's transcript and credit is given if the course is passed. If the course is failed, the "F" is considered equivalent to an "F" received under the "A-F" grading system and is included in calculation of the GPA. Once credit is received for a course taken under the P/F system, the course cannot be repeated under the "A-F" grading system.

Any course to be taken under the P/F option should be designated as such upon request for the course. The student may change grading options to P/F until the drop deadline and to A-F until the deadline for resigning without penalty.

Study Week

Study week refers to the last three calendar days of classes for each semester. All written work, with the exceptions noted below, should be assigned so that it can be graded and returned during a regularly scheduled class meeting of the term. In-class hour-long examinations or other major in-class written assignments or tests shall not be given during study week. The exceptions for undergraduate courses are:

1. Dates for turning in term papers and project reports may be set at the discretion of the instructor, provided that the student is not to be held responsible on the final examination for the subject matter therein.
2. In laboratory courses or other courses that do not warrant a final examination during the examination period, an examination, if required by the department and/or instructor, may be given during the last regularly scheduled laboratory or class period.
3. Regularly scheduled final examinations, when special permission has been granted by the dean of the appropriate college.

Graduate courses also have specific exceptions which may differ from those for undergraduate courses. Contact the Graduate School for details.

Transfer Credits

Enrolled students in good standing at Virginia Tech must receive pre-approval from their academic dean's office to transfer credit to Virginia Tech. Students who have been placed on academic suspension by the University are not eligible to transfer credit for terms of enrollment that coincide with their suspension term(s).

The rules below govern the transfer of credit on a university level. Some colleges at Virginia Tech have additional policies and procedures regarding transfer credit. Students are responsible for consulting with the academic dean's office in the appropriate college to discuss their plans to transfer credit, and to request information on the college's specific policies and procedures regarding transfer.

1. Courses for transfer must be taken at an accredited college or university.
2. Courses must be college-parallel, not terminal courses in a vocational program.
3. Only courses with a "C" grade or better will transfer. Note: A "C-" will **not** transfer.
4. Credits will **not** transfer for students who are classified as non-degree-seeking students.
5. Course equivalencies will be determined by the Office of the University Registrar.
6. Credit hours transfer; grades do not transfer.
7. Of the last 45 semester hours before graduation, a maximum of 18 semester hours may be transfer hours.
8. Many colleges and universities will require a letter of good standing from Virginia Tech before they will enroll a student from another university who wishes to transfer credits back. Virginia Tech students can request this letter certifying their good standing by completing a "Request for Certification" form in the Office of the University Registrar.
9. Upon completion of the course(s) and posting of grades, students are responsible for requesting that an official transcript be sent directly to the Office of the University Registrar at Virginia Tech as soon as possible, but not later than two semesters after the work is completed.

TOP

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Academic Policies

Curriculum for Liberal Education (CLE) at Virginia Tech

Why We Have It (Statement of Purpose)

As a vital component of undergraduate education at Virginia Tech, the Curriculum for Liberal Education (CLE)–required of all undergraduates--empowers our students with a broad base of knowledge and transferable skills. Liberal Education provides students the opportunity for rigorous intellectual encounters with enduring human challenges and important contemporary problems, through wide-ranging exposure to multiple disciplines and ways of knowing,

Through the study of the Sciences, Mathematics, Social Sciences, Histories, Languages and the Arts, the CLE is designed to foster and develop intellectual curiosity and critical thinking; strong analytic, communication, quantitative, and information literacy skills; the capacity for collaboration and creative problem solving; the ability to synthesize and transfer knowledge; intercultural knowledge and understanding; and ethical reasoning and action. The CLE seeks to create the conditions for growing creative and intellectual engagement; civic, personal, and social responsibility; and lifelong learning.

What Students Will Gain

A liberal education offers 21st century students the foundations of what they need to live and thrive as citizens in a globally engaged democracy, a knowledge-intensive economy, and a society where new ideas and understandings are essential to progress. The success of today's college students in their communities, workplaces, and across their lifetimes depends upon a complex and transferable set of skills and capacities. In their lives and in their careers, our students must be prepared to grasp complex problems, develop a global perspective on the diversity of human experience and knowledge, respond to changing demands, and articulate innovative responses and solutions. Today's students are very likely to change jobs and even careers several times over the course of their lives; and certainly, their roles and responsibilities in their families and communities will change and evolve over their lifetimes as well.

The breadth of a rigorous liberal education combined with the depth of specialized study in the student's primary academic discipline(s) --and evidenced in a demonstrated capacity to adapt and transfer knowledge, skills, and responsibilities to new settings and questions--is essential to the education of the whole student and sets the stage for a lifetime of learning and growth.

Curriculum for Liberal Education (CLE) Areas of Study

Because the Curriculum for Liberal Education is a "living curriculum,"there will be some changes from year to year. Courses added to the CLE offerings are generally available to students immediately after being approved. Some CLE requirements are phased in over a multi-year period. Thus, it is essential that students continue to consult with their advisors. Please visit the CLE homepage at http://www.cle.prov.vt.edu/ for more information, and for the *Curriculum for Liberal Education: A Guide for Students*.

Areas of Study

1	Writing and Discourse	6 credit hours required
2	Ideas, Cultural Traditions, and Values	6 credit hours required
3	Society and Human Behavior	6 credit hours required
4	Scientific Reasoning and Discovery	6 or 8 credit hours required
5	Quantitative and Symbolic Reasoning	6 credit hours required
6	Creativity and Aesthetic Experience	1 or 3 credit hours required
7	Critical Issues in a Global Context	3 credit hours required
**Students should consult with their advisors about specific college or departmental requirements in these areas.		

Area 1: Writing and Discourse

6 credit hours (2 courses) selected from first-year writing courses. Students entering in fall 1999 and thereafter must complete two (2) Writing Intensive courses. Students should consult with their advisor.

Area 1 requirements reflect the centrality of discourse in the larger intellectual community. Our first-year writing courses introduce students to the interrelated and shared modes of verbal communication that are distinctive to college life - argument, interpretation, analysis, and metaphor and whose various usages substantially delineate what it means to become broadly educated. But these beginning courses should

be thought of as the springboard for further writing and discourse throughout the undergraduate curriculum, especially in the disciplinary concentration.

In order to enable students to meet the aims both of liberal education and of professional preparation, we include writing in many courses throughout the university, even if it may not be the main intellectual skill emphasized in the course.

Students are encouraged to seek out courses that offer frequent opportunities for writing and related forms of discourse, both for the enhanced learning these courses can offer and for also their benefit to the student in terms of professional preparation. Many courses in the Curriculum for Liberal Education build upon the writing and verbal skills that are the direct goal of Area 1 by including a significant writing component and by encouraging the achievement of excellence in communicating ideas and knowledge.

Students may meet the first year writing requirement in one of three ways:

A. By successful completion of the two-semester sequence, ENGL 1105-1106 or COMM 1015-1016 (Note: COMM courses are limited. No advanced placement credit will be given for COMM courses. Student must take both COMM courses to satisfy Area 1);
B. By successful completion of ENGL 1106 (for students who are exempted from ENGL 1105 based on standardized test scores and high school class rank). Students who successfully complete ENGL 1106 at Virginia Tech in the first enrollment with a C- or better receive pass/fail credit for ENGL 1105.
C. By successful completion of ENGL 1204H (for students who meet English Department Honors standards or University Honors standards). Honors students who successfully complete ENGL 1204H at Virginia Tech in the first enrollment with a C- or better receive pass/fail credit for ENGL 1105.

Other information: Virginia Tech accepts ETS Advanced Placement credit for the freshman writing sequence

Area 2: Ideas, Cultural Traditions, and Values

6 credit hours (2 courses) selected from approved CLE courses

Every student should be introduced to some of the ideas, cultural traditions, and values that have shaped the human world we now inhabit. An educated person sees the present in connection with the past, and understands that presently prevailing values and meanings derive from the creative thought and action of men and women who have preceded us. A study of influential texts, ideas, representative works of art and technology, and the development of cultural traditions begins to free the student from the superficial fads of the moment and from narrow provincialisms. By examining some of the enduring ideas about human nature and achievement past and present, the individual gains a greater degree of self-knowledge and is better able to formulate worthwhile aims and commitments.

Courses in this curricular area take the human condition and human values as their main focus, while dealing with a range of subject matters: philosophy, literature and communication, history, religion, the arts, and technology. Most of these courses deal with some aspect of Western cultural experience in its numerous varieties. Relatively neglected dimensions of this experience such as the experience of women and minorities will be acknowledged and dealt with, both as an integrated aspect of many existing courses and in separate courses which focus directly upon these dimensions. The foreign language courses approved for Area 2 study the literatures of other countries in their cultural contexts. Moreover, since we are living increasingly in a global cultural context, courses are included that introduce the student to formative non-Western ideas, arts, and traditions as well.

See the *Curriculum for Liberal Education: A Guide for Students* for a listing of approved CLE courses in each Area of Study.

Area 3: Society and Human Behavior

6 credit hours (2 courses) selected from approved CLE courses

Human beings are not only participants in the world of human culture; we are also observers of it. The cultivation of systematic approaches to the study of humanity is one of the great achievements of the human intellect. Every student should therefore be introduced to the sciences of society and human behavior, a goal that can be accomplished through several avenues: through the study of psychology; through the study of social structures such as government, family, community, or economy; or through more wide-ranging examination of social patterns and processes. Such studies may examine past as well as present, non-Western as well as Western societies.

Courses in this curricular area are best characterized by their methods of study and theoretical frameworks. They look for regularities in human behavior rather than giving primary attention to the unique or non-repeatable aspects of life. If not quantitative, they tend at least to be descriptive. When varied human values and allegiances nevertheless make their appearance within these disciplines, they do so more as objects to be investigated than as commitments to be honored.

See the Curriculum for Liberal Education: A Guide for Students for a listing of approved CLE courses in each Area of Study.

Area 4: Scientific Reasoning and Discovery

6 credit hours of lecture (2 courses); 2 credit hours of related laboratory (2 labs)* selected from approved CLE courses

*Please note: Students should consult with their advisor as to what are the CLE Area 4 requirements in their specific college or department.

For many students at Virginia Tech, acquiring detailed knowledge of one or more of the natural sciences is essential. But for all students, a liberal education involves the study of what science is, of how it can be conducted, of what it can and cannot tell us about the world. Without scientific study and the experience offered by a laboratory, students perceive only vaguely how and why science functions as a crucial standard for rational knowledge and inquiry in modern life. The study of a science engages the student in analysis and deduction as well as empirical experimentation -- that is, in scientific reasoning and discovery.

The impact of the natural sciences and technology on our globally interdependent world is one of the most important realities we face as we enter the 21st century. The science courses in the Curriculum for Liberal Education have a special role in educating students about the critical relevance of scientific knowledge to the potentialities and dilemmas of our natural and social environments.

See the *Curriculum for Liberal Education: A Guide for Students*for a listing of approved CLE courses in each Area of Study.

Area 5: Quantitative and Symbolic Reasoning

6 credit hours (2 courses) selected from approved CLE courses

Like writing, mathematics is essential to intellectual inquiry in many areas. It is a basic language of the natural and social sciences and has become a useful tool for research in the humanities. The technological uses of mathematics and related forms of symbolic analysis are of tremendous significance to human society. Furthermore, the history of quantitative and symbolic reasoning as an intellectual discipline is linked with philosophy, the arts, and other aspects of human culture. Thus, a broad education must include these forms of reasoning, both as skills and as central modes of human thought. Mathematics, statistics, and certain areas of computer science and philosophy can all contribute to broadening a student's knowledge of quantitative and symbolic reasoning.

A diagnostic formula and testing procedure has been derived to predict readiness for Engineering/Science Calculus at Virginia Tech. A precalculus course, Math 1015, has been developed for those students who need further preparation. You can obtain information about the math diagnostic test from your advisor.

Many departments throughout the university have specific math sequence requirements. Be sure to check with your advisor about the requirements for your program.

See the *Curriculum for Liberal Education: A Guide for Students* for a listing of approved CLE courses in each Area of Study.

Area 6: Creativity and Aesthetic Experience

1 or 3 credit hours selected from approved CLE courses. Students in the College of Science and most majors in the College of Liberal Arts and Human Sciences must take one 3-credit-hour course. Students should consult with their advisors about specific college or departmental requirements.

The arts contribute significantly both to the experience and the interpretation of human life. Creativity and aesthetic response criss-cross the boundaries between intellectual ideas, the imagination, and actual design. Moreover, the arts are always intimately linked with the material culture of a society -- its modes of production and design -- as well as with its values and ideas. Thus, the arts can be studied and experienced in a variety of ways: as "high culture", as a means of tracing the history and ideas of particular societies, and as an active process of creative design and expression in many different physical forms. The metaphorical and intuitive thought processes that are essential to making and experiencing works of art are woven into many other human cultural and creative activities. Thus, the arts have an important role to play in broadening our sensibilities. Most artistic media include a highly public dimension -- concerts, exhibitions, performances, publications, public installations, and the built environment -- in which the creative works of artists, designers, and their collaborators are accepted or contested as meaningful elements of the larger social fabric. A guided exposure to the arts can provide a valuable framework for continued appreciation of, and participation in, the arts beyond college.

See the *Curriculum for Liberal Education: A Guide for Students* for a listing of approved CLE courses in each Area of Study.

Area 7: Critical Issues in a Global Context

3 credit hours (1 course) selected from approved CLE courses

Global interdependence is a powerful fact of life as we enter the 21st century. The dilemmas and possibilities humankind faces cannot be effectively addressed by any single culture or group of people acting alone. An awareness of critical issues of the day is thus an essential extension of liberal education and prepares students to respond thoughtfully to the complex world in which they live. As a state institution of higher education, Virginia Tech has a responsibility to prepare students to react creatively and constructively to the social, international, intercultural, and environmental challenges that confront the Commonwealth and the world.

The university requires that undergraduates take at least one course that deals in a substantial way with major issues of critical importance for the larger global society. Courses that satisfy this requirement can be taken in any area of the curriculum, including the major, the Curriculum for Liberal Education, or electives. Students may select from a wide range of courses that focus on major international and intercultural issues in contemporary world affairs, including such areas as politics, the management of conflict, the roles of economic

competition and cooperation, demographic issues, and the emerging world order. Many science courses in Area 7 will examine global issues associated with environmental decline and restoration. Some engineering courses study the role of technology as a major force in shaping the cultural and economic conditions of human societies. Other courses include comparative or cross-disciplinary examinations of cultures, societies, and belief systems, including those of developing countries. Other courses examine the social and personal implications of cultural, racial, and gender-based differences. Whatever the topical focus of the course, all Area 7 courses utilize interdisciplinary approaches in which a number of relevant factors - historical, ethical, technological, cultural, and/or scientific -- are brought to bear on the issues being studied.

See the *Curriculum for Liberal Education: A Guide for Students* for a listing of approved CLE courses in each Area of Study.

Please note, there are some differences among colleges and departments as to which Curriculum for Liberal Education courses students should take to fulfill their CLE Areas of Study. Please consult your advisor and the *Curriculum for Liberal Education: A Guide for Students*. The Assistant Provost for Liberal Education and University Studies may also be contacted with questions concerning the Curriculum for Liberal Education. (122 Hillcrest Hall; contact administrative assistant balberts@vt.edu)

Academic Policies

University Policies Governing Enrollment

Appeals

Under extenuating circumstances, the student's academic dean may present appeals for re-admission and other exceptions to academic policies to the Virginia Tech Academic Appeals Committee on behalf of the student. Students presenting appeals based on medical reasons must request recommendations from the Student Health Evaluation Committee.

Auditing Courses

A student may enroll as an auditor in any class other than laboratory classes and studio courses, with the permission of both their academic advisor and the class instructor. The lecture portion of laboratory-linked courses and courses with computation periods may be designated as eligible for audit at the request of the academic department head (of the course in question) and on the approval of the student's academic dean. Auditors may not add or drop an audit option after the last day to enter classes. Students will not be allowed to register for credit in any course previously audited.

Class Level

A student must have received credit for at least 30 hours to be classified as a sophomore, at least 60 hours to be classified as a junior, and at least 90 hours to be classified as a senior.

Course Prerequisites (University Policy on)

Students are permitted to take courses without having the specified prerequisites only upon obtaining the consent of the instructor. Students who enroll in a course for which they clearly have not satisfied the prerequisites or equivalent or obtained the appropriate permission may be dropped from the course. Deliberately false statements testifying to the satisfaction of prerequisites constitute a violation of the honor code. Students have the right to appeal a decision about prerequisites to the head of the department offering a course. Students should recognize that 3000 and 4000 level courses assume a certain level of academic maturity and general background regardless of the stated prerequisites. The course instructor can be consulted regarding the implications of this expectation for a specific course. The pass/fail option provides students an opportunity, with the instructors' permission, to enroll in courses for which they may not have the prerequisites.

Enrollment, Semester Hour

Minimum full-time enrollment for undergraduate students is 12 hours per semester in regular A-F option or P/F option. For each summer session, the minimum is 5 hours. Audit hours are not used in establishing minimum full-time enrollments.

Full-time enrollment for graduate students is 9 hours or more in regular A-F option, P/F option, or equivalent credit. For each summer term, the minimum is 3 hours. Neither the payment of full fees nor compliance with maximums established as a condition of employment or appointment is a basis for deviation from the definition above.

Graduation With Distinction

A student who has completed at least 60 credit hours of undergraduate level course work at Virginia Tech may be graduated with distinction under the following conditions:

1. Students with a cumulative GPA of 3.8 or greater are graduated ***Summa Cum Laude***.
2. Students with a cumulative GPA of 3.6-3.7999 are graduated ***Magna Cum Laude***.
3. Students with a cumulative GPA of 3.4-3.5999 are graduated ***Cum Laude***.

In computing eligibility for graduation with distinction, only undergraduate level work attempted at Virginia Tech will be used. Students may

not use hours earned at Virginia Tech as an associate, professional, or graduate level as part of the 60 semester hours required. The notation of distinction on the diploma and on the transcript is independent of the notation of a degree in honors, if applicable. (See section on "The Honors Program" for information about graduating *in honors*.)

Limits on Acceptable Credits for Degrees

Not more than 6 credit hours earned from extension courses, radio courses, television courses, and intensive courses (e.g. taken while in active military service, etc.) will be accepted for undergraduate degree credit. Thirty-eight hours of advanced placement credit may be accepted towards the undergraduate degree. Please consult your academic dean for further information and/or refer to Commission on Undergraduate Studies report, "Undergraduate Credit at Virginia Tech," (February 1989), which is available from the University Registrar. (See section on "Hours Passed" for other limitations with regard to counting credits for graduation.)

Readmission through the University Registrar or Academic Dean

Formerly enrolled students who have greater than the 2.0 GPA may seek readmission via web course request form if they are eligible to return. During fall semester, students returning from academic suspension should consult their academic dean's office for readmission procedures. (These procedures vary from college to college within the university.)

Formerly enrolled students in good academic standing who resign for personal reasons, do not continue enrollment at Virginia Tech, and later complete course work at another college or university are required to submit their transfer transcripts to their academic dean prior to or during their first term of re-enrollment.

Resignations

A student may resign without academic penalty by completing an official Virginia Tech resignation form on or before the published resignation deadline for each term. The student can request this resignation form from either the University Registrar's Office or the Dean's Office. The student's grade report and permanent record will show that he/she was enrolled for the term and that he/she resigned on the specific effective date.

A student who resigns after the stated deadline without written authorization for resignation-without-penalty by the respective academic dean will receive automatic "F" grades in all courses in which the student is enrolled. The transcript will carry the notation, "Suspended by committee action for unauthorized resignation," and the hours for which "F" grades were received will be included in the cumulative GPA for both academic eligibility and graduation requirements.

In the case of authorized resignations after the deadline, grades will not be assigned, and the academic dean will determine the student's academic status (whether or not he/she is eligible to return) based on the student's previous record.

Satisfactory Progress

University policy requires that all students meet the following minimum criteria to be certified as making satisfactory progress toward a degree.

1. Have an overall grade point average at or above that specified in the academic eligibility schedule (determined at the end of the Spring semester).
2. Upon having attempted 36 semester credits (including transfer, advanced placement, advanced standing, credit by examination, and freshman rule hours), students must have passed at least 12 semester credits of Curriculum for Liberal Education (a.k.a. University Core Curriculum) requirements.
3. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule hours), students must:
    I. have passed at least 24 semester credits of Curriculum for Liberal Education (a.k.a. University Core Curriculum) requirements;
    II. be enrolled in a degree-granting program; and
    III. be certified at the close of the academic year by their department as making satisfactory progress toward a degree, based upon pre-established minimum criteria from departmental checksheets.
4. Upon having attempted 96 semester credits (including transfer, advanced placement, advanced standing, credit by examination, and freshman rule hours), students must have an in-major grade point average of 2.0 or above.

Colleges and departments may impose additional requirements. It is the student's responsibility to become familiar with the requirements of his or her college.

Transfer Work while on Suspension

Inquiries concerning probation and suspension should be directed to the student's academic dean.

A student may not receive credit for course work taken at another college or university during any period in which the student has been placed on suspension by Virginia Tech for academic or disciplinary reasons.

Undergraduates Taking Graduate Courses

Undergraduate students may enroll in graduate-level course work in the senior year, provided they have an overall GPA of 3.0 or above and the written approval of the department head and the Graduate School. To enroll in graduate-level course work, the undergraduate student must apply to the Graduate School as a dual registrant. Each term that a student is dually enrolled, he or she must fill out a form in the University Registrar's Office to indicate which courses are being counted for undergraduate credit and which for graduate credit. If graduate courses are used to satisfy undergraduate degree requirements, they cannot be used to satisfy any advanced degree requirements at Virginia Tech.

Graduate courses may not be taken without prior written approval from the Graduate School.

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Academic Policies

Using This Catalog

Abbreviations

- Miscellaneous abbreviations used only in the course descriptions include:

C-	credits	I-	Fall semester
Co-	corequisite	II-	Spring semester
H-	hours in classroom	III-	First summer session
L-	hours in laboratory	IV-	Second summer session
Pre-	prerequisite		

- The Roman numeral designations for the terms in which courses are offered are intended only as general guides and do not indicate binding agreement to offer in those terms.

Course Descriptions

The following undergraduate departmental course offering abbreviations are used in the tables and course descriptions in the undergraduate catalog.

AAEC — Agricultural and Applied Economics
AEE — Agricultural and Extension Education
ACIS — Accounting and Information Systems
AFST — Africana Studies
AHRM — Apparel, Housing, and Resource Management
AINS — American Indian Studies
ALS — Agriculture and Life Sciences
APSC — Animal and Poultry Sciences
AOE — Aerospace and Ocean Engineering
ARCH — Architecture
ART — Art and Art History
AS — Aerospace Studies (AFROTC)
AT — Agricultural Technology
BC — Building Construction
BCHM — Biochemistry
BIOL — Biological Sciences
BIT — Business Information Technology
BMVS - Biomedical & Veterinary Sciences
BMSP - Biomedical Sciences and Pathobiology
BSE — Biological Systems Engineering
CEE — Civil and Environmental Engineering
CEP — Cooperative Education Program
CHE — Chemical Engineering
CHEM — Chemistry
CHN — Chinese
CLA — Classics
COMM — Communication
COS — College of Science
CS — Computer Science
GER — German
GR — Greek
HEB — Hebrew
HD — Human Development
HIST — History
HNFE — Human Nutrition, Foods and Exercise
HORT— Horticulture
HTM — Hospitality and Tourism Management
HUM — Humanities
IDS — Industrial Design
ISE — Industrial and Systems Engineering
IDST— Interdisciplinary Studies
IS — International Studies
ITAL — Italian
ITDS — Interior Design
JPN — Japanese
JUD — Judaic Studies
LAR — Landscape Architecture
LAHS — Liberal Arts and Sciences
LAT — Latin
LDRS — Leadership Studies
MATH — Mathematics
MASC — Mathematical Sciences
ME — Mechanical Engineering
MGT— Management
MINE — Mining and Minerals Engineering
MKTG — Marketing
MN — Military Navy (NROTC)
MS — Military Science (AROTC)

CSES — Crop and Soil Environmental Sciences
DASC — Dairy Science
ECE — Electrical and Computer Engineering
ECON — Economics
EDCI — Curriculum and Instruction
EDCT— Career and Technical Education
EDHL — Health Education
EDPE — Health, Physical Education, Recreation
EDTE — Technology Education
ENGL — English
ENGE — Engineering Education
ENGR — Engineering
ENSC — Environmental Science
ENT — Entomology
ESM — Engineering Science and Mechanics
FA — Fine Arts
FIN — Finance, Insurance, Business Law
FIW — Fisheries and Wildlife Sciences
FOR — Forestry
FL — Foreign Languages
FR — French
FST — Food Science and Technology
GEOG— Geography
GEOS — Geosciences
MSE — Materials Science and Engineering
MUS — Music
NR — Natural Resources
PHIL— Philosophy
PHYS — Physics
PPWS — Plant Pathology, Physiology, and Weed Science
PORT— Portuguese
PSCI — Political Science
PSYC — Psychology
REL — Religion
RUS — Russian
SOC — Sociology
SPAN — Spanish
SPIA — School of Public and International Affairs
STAT — Statistics
STS — Science Technology Studies
TA — Theatre Arts
UAP — Urban Affairs and Planning
UH — University Honors
VM — Veterinary Medicine
WOOD — Wood Science and Forest Products
WS — Women's Studies

Changes in Catalog Information

- **Caution:** The course offerings and requirements of Virginia Tech are under examination and revision continually. This catalog presents the offerings and requirements in effect at time of publication, but in no way guarantees that they will not be changed or revoked.
- The regulations and policies may change to meet new needs or as legislation is approved. Such changes are published in the President's Policy Memoranda.
- The policies and regulations that appear in this catalog are not meant to form a contract or to constitute an offer of one. Current information may be obtained from the following:
- *Undergraduate Admission Requirements:* **Director of Admissions.**
- *Course Offerings:* **Academic departments offering the course(s) in question.**
- *Degree Requirements:* **Office of the University Registrar, head of major department, or dean of the college.**
- *Fees and Tuition:* **Office of the University Bursar.**

Course Numbering System

The first digit in course number designations denotes the year in which the course ordinarily is found in the curricular outlines or "checksheets," which are available from the major department or academic advisor. The second and third digits make the course number unique within a department. The fourth digit is 4 if the course is a one-term terminal course, 5 if the course is the first term in a sequence, and 6 if the second term in a sequence. As a general rule, courses with 0 as the first digit do not carry university credit. Agricultural Technology courses, however, are an exception.

Cross Listed Courses

Courses that are cross listed between departments may not be counted twice toward meeting graduation requirements. No credit will be allowed for a course taken that duplicates subject matter in a course for which credit already has been received. Cross listed courses are indicated in the title line of course descriptions; for instance, REL 3454 is listed as follows:

- 3454 (PHIL 3454): PHILOSOPHY OF RELIGION

The first number is the Religion course number, while the number in parentheses indicates that the course is cross listed with Philosophy.

Graduate Courses Listings

Information regarding graduate courses (5000 and above) may be found in the Graduate Catalog.

Prerequisite Notations and Requirements

Students are permitted to take courses without having the specified prerequisites only upon obtaining the consent of the instructor. Students who enroll in a course for which they have not clearly satisfied the prerequisites or equivalent, or obtained the appropriate permission, may be dropped from the course. Deliberately false statements testifying to the satisfaction of prerequisites constitute a violation of the honor code. Students have the right to appeal a decision about prerequisites to the head of the department offering a course. Students should recognize that 3000 and 4000 level courses assume a certain level of academic maturity and general background regardless of the stated prerequisites. The course instructor can be consulted regarding the implications of this expectation for a specific course. Students must consult with the instructor if they wish to use the Pass/Fail option in a course for which they do not have the prerequisites.

Students should note prerequisite and corequisite requirements as stated in the course descriptions. Courses in a series may be taken independently where the series of course numbers is separated by commas (e.g., 3135, 3136), in the catalog listing. Where the series of course numbers is connected by hyphens (e.g., 4135-4136), the first course is prerequisite for the next one.

Tables

The numbers on the right hand side of tables listed under certain departments denote the number of hours the class meets each week during the term and, in parentheses, the number of credits allowed for the course. A listing such as 3(3) means that the course meets three hours each week and three credits are earned.

University Academic Advising Center

Kimberly S. Brown, Director
Therese Lovegreen, Associate Director
Elaine Matuszek, Associate Director
Advisors: J. Chatham; C. Crawford; A. Fizzano; M. Giglio; H. Goetz; J. Kelly; M. McGlothlin Lester; R. Selberg-Eaton
For further information: 540/231-8440

The University Academic Advising Center serves the university community in several ways. First, it administers the University Studies program for new undergraduate students who want to explore a variety of degree programs before they commit themselves to one particular major. Students who enter Virginia Tech as University Studies students are not limited to pursuing a specific major in their first year. With the guidance of a faculty advisor, students research the full range of degree programs related to their interests and design programs of study that meet graduation requirements while providing the students with the academic flexibility to pursue whichever degree program they ultimately choose. Second, the advising center assists new students who intend to reapply to competitive admission majors. Advisors work with these students in developing programs of study that meet the established criteria for entrance to their chosen major. Third, for these two student populations the University Academic Advising Center serves as both the college and department, providing administrative services, dean's office services, and academic advising until the students enter a specific major.

University Studies

University Studies is a major but it is not a degree program. University Studies offers a structured advising program that provides students with the necessary support and strategies to investigate and compare academic disciplines so that they can make informed decisions about the degree programs they will pursue. Students can explore any major available at the university while completing course requirements toward a baccalaureate degree. To ensure that students graduate in a timely manner, University Studies requires all students to enter a specific degree program by the time they have completed 60 hours toward graduation (approximately the end of the sophomore year) or have attempted 72 hours.

Restricted Majors

University Studies students can pursue any major offered at the university; however, students should be aware that some majors are competitive for internal transfer. These programs have established specific criteria and application procedures that students must fulfill in order to be considered for internal transfer into the major. In general, these criteria require students to demonstrate proficiency in designated core courses and, for some programs, in introductory major courses before they are eligible to apply. University Studies students enter and graduate from these restricted programs each year; however, since there is no guarantee of acceptance to these programs, students are encouraged to investigate alternative majors even as they prepare to enter a restricted program.

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Restricted Programs for Internal Transfers:

College of Agriculture and Life Sciences

Human Nutrition, Foods and Exercise

College of Architecture and Urban Studies:

Architecture
Art and Art History - Visual Communication Design; Studio Art
Industrial Design
Interior Design

Pamplin College of Business:

Accounting and Information Systems
Business Information Technology
Finance, Ins. & Business Law
Hospitality and Tourism Management
Marketing
Management

College of Engineering:

All majors--including Computer Science

College of Liberal Arts and Human Sciences:

Communication
History
Music
Political Science and International Studies

Faculty advisors in the University Academic Advising Center are familiar with the internal transfer criteria and procedures for all restricted programs and will assist students in fulfilling these requirements.

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Curriculum for Liberal Education

All undergraduate students at the university, regardless of their majors, are required to fulfill general education course requirements in English, mathematics, science, social science, humanities, etc. There is a standard set of these courses, the Curriculum for Liberal Education, that all degree programs incorporate in their graduation requirements.

In general, Liberal Education requirements are completed in the freshman and sophomore years. Some majors are flexible with regard to which Liberal Education courses can be used to fulfill degree requirements; other majors designate specific Liberal Education course selections. Faculty advisors assist University Studies students in selecting courses that apply toward as many of the majors a student is considering as possible. Thus, students fulfill degree requirements for graduation while they are exploring majors and are able to graduate on time.

Typical First Year Program

First Semester	**Second Semester**
English composition	English composition
Mathematics	Mathematics
Natural science (lab-if required by intended major)	Natural science (lab-if required by intended major)
Social science	Social science
Humanities/elective	Humanities/elective

For University Studies students, as for most students at the university, the first year is primarily devoted to fulfilling Curriculum for Liberal Education requirements. Of course, University Studies students' programs of study vary depending upon the major or majors they are considering. Specific course selections are determined in individual consultation with a faculty advisor.

Graduation Requirements

The requirements to graduate in a specific major are determined by the department and college conferring the degree. In general, students are required to have a minimum 2.0 overall grade-point average and a minimum 2.0 grade-point average in their major in order to graduate. The number of credit hours required for a baccalaureate degree varies from 120 to 136 hours, depending upon a student's major and degree program.

The Honors Program

Students with exceptional intellectual and creative abilities are encouraged to participate in the University Honorsprogram. Through

honors sections of regular courses, honors seminars, and independent study opportunities, the Honors Program offers students unique and challenging intellectual experiences. Entering freshmen are invited to participate in the Honors Program if they 1) have a cumulative score of 1300 or above on the Scholastic Aptitude Test (SAT) with a minimum score of 620 on the verbal section and a minimum score of 600 on the math section and 2) they are in the top 10 percent of their high school class. Students may be selected to participate in the program if they maintain an overall 3.5 GPA (grade-point average) while enrolled as full-time students.

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Dean's List

University Academic Advising Center students who demonstrate academic excellence are named to the Academic Dean's List and are awarded a Dean's List certificate. Students must be enrolled in a minimum of 12 graded hours (A-F) and must achieve a 3.4 GPA or higher to qualify.

Pre-Professional Advising

Students who want to enter professional schools but who have not yet chosen an undergraduate major will find that the university offers a variety of degree programs that provide excellent preparation for advanced training in professional fields. Though some professional programs, such as medicine, dentistry, and veterinary medicine, require students to complete a minimum number of credit hours at the undergraduate level in chemistry, biology, mathematics, etc., professional schools do not dictate that students pursue specific undergraduate majors. Some examples of undergraduate majors that are frequently chosen as preparation for professional training appear below, but a student can pursue almost any undergraduate degree and be competitive for admission to a professional program.

Study Abroad

Opportunities to study at institutions in other countries are available to all qualified students, regardless of their major. Study abroad offers students a unique opportunity to learn about other cultures and peoples while earning college credit. Students who intend to participate in an overseas study experience should discuss their intentions with their faculty advisor early in their academic career.

University Honors Program

Dr. Terry Papillon, Director
Christina McIntyre, Associate Director
Tom Sitz, Pre-Med Advisor
Russell B. Shrader, Assistant Director
Michael J. Stacy Blackwell, Assistant Director
Michelle Wooddell, Office Manager
Tammy Jo Craft, Secretary
Charles J. Dudley, Director Emeritus
For further information: 540-231-4591
Link: www.univhonors.vt.edu

University Honors Program

In keeping with the university's commitment to provide educational opportunities consistent with the ability of the individual student, Virginia Tech invites a select group of students to enroll in Honors. University Honors provides a combination of special sections of regular courses, honors seminars and colloquia, tutorials, independent study, and undergraduate research. Honors courses enable students of superior academic talent to be challenged to their full intellectual capacity. The honors faculty includes Alumni Distinguished Professors, University Distinguished Professors, and members of the university's Academy of Teaching Excellence. University Honors represents a combination of study within departments and course work cutting across departmental lines. The program is designed both to broaden and deepen the student's intellectual life.

Participation

Incoming freshmen are invited to apply for University Honors on the basis of their standardized test scores and high school records. Transfer students and continuing Virginia Tech students who achieve a GPA of 3.50 or greater are invited to apply. Students remain in the program on the basis of their continued high academic performance and the pursuit of one of five honors degrees.

Course Selection

Course selection is not necessarily tied to the student's major field of study.

Lower division honors students may participate in honors reading groups, honors colloquia and honors sections of regular courses. Normally, honors sections of regular academic courses are offered in biology, political science, history, economics, chemistry, english, mathematics, and psychology. Occasionally, honors sections are offered in other subject areas as well.

Upper division honors students also are eligible for these options, as well as, honors undergraduate research, honors tutorials, honors agreements, graduate courses.

Honors Degree

An honors degree is a designation to the undergraduate degree. One University Honors degree would not suffice at a University such as Virginia Tech. We have created five Honors options for the students eligible for Honors. They are of increasing difficulty in requirements. Students must declare which degree they seek at the beginning of the second year, and while they can change, most do not.

Degree	Description
Commonwealth Scholar	Considered to be a viable degree option for transfer students entering University Honors late in their college career and having earned 60 credit hours.

Scholar in Health Studies	Created for students desiring to enter a career in a health related field or seeking admission into a professional medical school; gained in connection with the minor in Medicine and Society.
Honors Scholar	Designed for students majoring in a field that generally leads directly to the career field following graduation (i.e. Education, Tourism & Hospitality Management, Forestry).
In Honors	For students desiring to enter graduate school or professional school immediately following graduation and interested in undergraduate research.
Honors Baccalaureate	The most rigorous degree available to University Honors students. Designed to prepare students for graduate or professional school immediately following graduation.
Combined Bachelors/Masters	For talented students wishing to move directly to graduate work in their chosen field at Virginia Tech.

Throughout the course of an Honors student's career there are several benchmarks for obtaining the various degrees. Following the freshman year, students declare their degree intention. Declaring candidacy occurs in the junior year. As a senior, University Honors students order their honors degrees.

Graduation Requirements

- University Honors students must maintain a cumulative grade point average of 3.50 or higher.
- University Honors students must meet all the requirements determined by the department of one major and college conferring the degree.
- University Honors students must complete all expectations for one University Honors degree.

Honors Advising

Each University Honors student is assigned a staff member in the Honors office for Honors advising once he/she has declared candidacy for a University Honors degree.

Additional Honors Advisors in each major department work specifically with University Honors students. These Honors Advisors act as an extension of the University Honors office to help students with exceptional advanced opportunities within their chosen field of study.

Advising for major national scholarships like Rhodes, Marshall, and Fulbright Scholarships are available through University Honors for all Virginia Tech students.

Advising for professional programs in medicine and dentistry is available through University Honors. Interested students must complete requirements of that program. See the following link: http://www.univhonors.vt.edu/.

Undergraduate Course Descriptions

2974H: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2984H: SPECIAL STUDY
Variable credit course.

3004H: HONORS COLLOQUIA SERIES
(2H,3C)

4974H: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4984H: SPECIAL STUDY
Variable credit course.

4994H: UNDERGRADUATE RESEARCH
Variable credit course.

Colleges & Course Descriptions

Colleges

- Agriculture & Life Sciences
- Architecture & Urban Studies
- Engineering
- Liberal Arts and Human Sciences
- Natural Resources
- Pamplin College of Business
- Science
- Veterinary Medicine

Course Descriptions

Using this Catalog

College of Agriculture & Life Sciences

www.cals.vt.edu/

Loke T. Kok, Interim Dean
Associate Dean & Director of Academic Programs: Susan S. Sumner
Associate Dean & Director of Virginia Agricultural Experiment Station: Craig Nessler
Interim Associate Dean & Director of Virginia Cooperative Extension: Rick Rudd
Associate Dean for International Agriculture & Associate Director of the Office of International Research, Education, and Development: Mike Bertelsen
Director of Agricultural Technology: Pavli Mykerezi

Overview

The College of Agriculture and Life Sciences provides an education in the science and business of life. Basic life sciences and animal, plant, and food sciences – not to mention biotechnology, environmental sciences, human health and nutrition, and economic development – are just some of the choices available to you as an undergraduate major. If your ultimate goal is to apply to veterinary school, you will want to explore the excellent pre-vet preparation offered in many of the college's majors. Excellent faculty and academic advisors are eager to work with you. You will also find more than 30 student organizations and nationally-competitive teams in the college. The college offers the educational environment and learning experiences graduates need in order to develop skills for addressing the challenges facing society and the world today. You may work beside scientists in their laboratories or participate in internships with business or industry.

Undergraduate Programs

The undergraduate program in the college is organized into majors designed for students with widely different interests. These majors permit the student to achieve a satisfactory degree of specialization while providing the fundamentals necessary for continuing professional growth after graduation.

Undergraduate majors are offered in agricultural and applied economics, agricultural sciences, agricultural technology (associate degree), animal and poultry sciences, biochemistry, crop and soil environmental sciences, dairy science, environmental science, food science and technology, horticulture, and human nutrition, foods, and exercise. Some students may be assigned special advisors if their objective is to prepare for graduate study in entomology, plant pathology, plant physiology, weed science, or integrated pest management.

Freshman students also may enter the college with the designation LFSC (Life Sciences, Undecided). Upon completion of the freshman year, a college major should be selected.

See College of Engineering for Biological Systems Engineering.

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Honors Program

During the junior and senior years, departments may invite a selected number of majors to candidacy for a degree "in honors." At this time, a student's work focuses on the major interests and part of the work is in independent study. Areas offering work leading to a degree "in honors" are agricultural economics, animal and poultry sciences, biochemistry, crop and soil environmental sciences, dairy science, food science and technology, and horticulture.

Curriculum for Liberal Education and College Core Requirements

The College of Agriculture and Life Sciences requires bachelor's degree students to complete the following minimum core curriculum which includes the Curriculum for Liberal Education requirements. University requirements are in parentheses. Semester hour credits required are listed at right.

Mathematics and Natural Sciences	**(20)**
Mathematics/Statistics (Area 5)	6
Chemistry/Physics/Geology[1]	6
Biology[1] (Area 4)	6
Laboratory in Nat. Sci.[1]	2
Humanities/Fine Arts and Social Sciences	**(22)**
English[2] (Area 1)	6
Ideas, Cultural Traditions, and Values (Area 2)	6
Creativity and Aesthetic Experience (Area 6)	1
AAEc/Econ[3] (Area 3)	6
Critical Issues in a Global Context (Area 7)	3
Credits in Major and Restricted Electives (max.)	**(72)**
Free Electives (minimum)	6
Total Requirements for Graduation	**120**

[1] Most majors require 8 credits each of chemistry and biology with laboratories. Refer to departmental check sheets for exceptions.
[2] Placement may reduce the minimum credits required in freshman English but does not change the total credits required for graduation.
[3] Majors in the Department of Biochemistry are exempt from this requirement and may use other approved courses to satisfy Area 3 of the University requirement.

Students who plan to transfer to Virginia Tech and major in the College of Agriculture and Life Sciences after two years of community or junior college enrollment are encouraged to complete as many of the Liberal Education courses as possible before they transfer.

Cooperative Education

The Cooperative Education Program is available to qualified undergraduates in the college. Information on the program is listed in the chapter, "Academics." Courses of study included in the Cooperative Education Program are: agricultural engineering, animal science, biochemistry and nutrition, dairy science, food science and technology, horticulture, and poultry science.

International Study Opportunities

The Academic Programs Office in the college, in cooperation with the Office of International Research and Development, offers several avenues for students both in and outside the college to gain international knowledge and experience. These study opportunities allow students and faculty to become aware of and develop basic knowledge of food, fiber, and environmental issues in the world. Specific activities include study abroad programs and courses, international internships, formal student exchange programs, seminars and workshops on campus, and courses in the college which focus on international topics. In addition, the Concentration in International Agriculture is available which involves selecting 18 credit hours of study from a selected list of courses. Students wishing to explore this concentration should contact the Office of Outreach and International Affairs.

Selected departments in the college offer recognized options in international development. The Department of Agricultural and Applied Economics offers the International Trade and Development Option, and the Department of Crop and Soil Environmental Sciences offers the International Development Option. Students wishing to explore either of these options should contact the coordinating advisor in those departments.

Agricultural Technology Program

The Agricultural Technology Program offers a concentrated academic experience for individuals pursuing an associate degree in preparation for careers in the agricultural and green industries. Students can specialize in either Applied Agricultural Management or Landscape and Turf Management. Additional information is available at the program's website at www.agtech.vt.edu. The program handles its own admissions. Applications and inquiries should be addressed to: Brenda French, Admissions Coordinator, 1060 Litton-Reaves Hall (0334), Blacksburg, VA 24061, or call 540-231-7649.

Graduate Programs

At the graduate level, the college offers educational programs leading to the M.S. and Ph.D. Complete information on these programs may be found in the Graduate Catalog.

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Natural Resources | Pamplin College of Business | Science | Veterinary Medicine

College of Agriculture and Life Sciences

Agricultural and Applied Economics

www.aaec.vt.edu/aaec/

Kevin J. Boyle, Head
Professors: J.R. Alwang; D.J. Bosch; G. C. Davis; M.J. Ellerbrock; L.L. Geyer; R.H. Lytton; B.F. Mills; M. A. Marchant; G. W. Norton; J. Schleich; M. Norton; D.R. Orden; J. Pease; K. Stephenson; D.B. Taylor
Associate Professors: G.E. Groover; A. Marathe; E.B. Peterson; D.W. Reaves
Assistant Professors: J.H. Grant; D. Mainville; C.F. Parmeter; J.C. Pope; W. You
Instructors: R. Crowder; S. Sink; W.A. White
Career Advisor: K. Stephenson

Overview

What is one thing that each and every one of us has in common? We are all consumers of food and clothing. Agricultural Economics (Ag Econ) deals with the efficient production, distribution and marketing of food and fiber products. Ag Econ students have a choice of six options designed to provide the skills needed to have successful careers in agricultural and small business management, marketing and finance; financial planning; veterinary business management; community economic development; environmental policy and planning; and international trade and development.

The Agribusiness Management Option is designed to prepare graduates to enter the largest industry in the world: the food industry. Courses in accounting, economics, statistics, computer techniques, marketing, and agricultural policy supplement an agricultural economics base, enabling B.S. graduates to obtain the skills necessary to become managers in the agribusiness sector. Students can choose to specialize in Agricultural Finance, Farm Business Management, Marketing and Futures, or an approved minor in another discipline. Graduates pursue careers in finance, management, marketing, real estate, investments, extension, and education. Many graduates choose to establish and run their own businesses.

The Environmental Economics, Management and Policy Option builds upon a broad agricultural economics base with courses in the economics of resource use, planning, public policy, environmental economics, and political science. This training prepares graduates to work with agencies and organizations in conducting benefit-cost analyses of decisions, and in dealing with problems of rural poverty, efficient use of natural resources, and provision of public services to non-urban areas.

The International Trade and Development Option requires a multidisciplinary background to help prepare students for careers in the fast-growing areas of international trade and development. Students seek careers with corporations, the Peace Corps, private voluntary agencies, and national and international government agencies.

The Community Economic Development Option prepares students to work with local governments to manage issues related to improving economic conditions in rural areas. Topics include rural job creation, labor markets, growth/agriculture conflicts, and land use management. Employment in local governments has grown dramatically in recent years as these governments take increased responsibility for implementing policy. Students may also prepare for jobs in state and federal government, or for non-governmental organizations working on rural issues.

The Veterinary Business Management Option prepares students for admission to a college of veterinary medicine and the management of a veterinary practice. Students take the required science courses for admissions to a veterinary school and a selection of management courses to prepare the student to manage the veterinary practice. This option is available under a three- or four-year course of study.

The Financial Planning Option prepares students to enter the diverse and rapidly growing career to practice personal financial planning. Financial planners help their clients – individuals, families, and small businesses – to identify and achieve their goals. Career opportunities range from employment with small “boutique” financial planning firms that serve a niche market to nationally recognized companies that provide financial planning products and services. Graduates work directly with client services, or in the “back office” doing advisor support, product analysis, plan preparation, or compliance. Positions also are available in banking, insurance, investments, or employee benefits and retirement planning.

Students in all options begin with the same general course work. It is not necessary to declare which option is desired until the sophomore or

junior year. Each student is encouraged to visit with the faculty concerning his or her special interests and to seek advice on which curriculum option best serves his or her career goals. Flexibility is available in all options to allow for students interested in pursuing a double major or minor(s) in other departments.

Students in other curricula are invited to inquire into the requirements for either a minor or a double major in agricultural economics.

Graduates of agricultural and applied economics have a wide variety of employment opportunities with marketing firms, banks and agricultural credit agencies; processing and industrial firms; brokerage and investment firms; real estate appraisal firms; small businesses; local, state, and national governmental agencies; and international organizations. Some graduates enter law school or vet school, or pursue an MBA or other graduate degree.

Programs leading to the M.S. and Ph.D. are available (see Graduate Catalog).

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Course Requirements for Majors

Course requirements are listed under Section I, Curriculum for Liberal Education, College and Departmental Core requirements and Section II, specific requirements by departmental option. Section II also lists restricted and free electives by option area. For all options except Veterinary Business Management, students are allowed 29-30 hours of restricted or free electives. Students are encouraged to complete minors or double majors in other departments. All options require 120 credit hours to graduate.

I. Curriculum for Liberal Education, College and Departmental Core (Options A-D and F)

ENGL 1105-1106: Freshman English (Area 1, Liberal Education)	6
Ideas, Cultural Traditions, and Values (Area 2, Liberal Education)	6
AAEC 1005-1006: Economics of the Food and Fiber System (Area 3, Liberal Education)	6
BIOL 1005, 1006, 1015, 1016: General Biology and labs (Area 4, Liberal Education)*	8
MATH 1525-1526: Elementary Calculus with Matrices (Area 5, Liberal Education)*	6
Creativity and Aesthetic Experience (Area 6, Liberal Education)	1
ACIS 1504, ALS 1514, or CS 1004: Computer Literacy	2 or 3
ACIS 2115-2116: Principles of Accounting*	6
COMM 2004: Public Speaking*	3
ENGL 3774: Business Writing*	3
STAT 3615-3616 or BIT 2405,2406: Statistical Methods*	6

II. Requirements for Options (Area of Specialization Requirement -- 18 hours)

A. Agribusiness Management Option

AAEC 3404: Agricultural Financial Management	3
AAEC 3414: Farm, Cooperative, and Agribusiness Mgmt.	3
AAEC 3424: Food and Agribusiness Marketing Mgmt.	3
AAEC 3454: Small Business Management and Entrepreneurship	3
AAEC 3504: Marketing Agricultural Products	3
AAEC 3604: Agricultural Law	3
AAEC 4404: Agricultural Management and Problem Solving	4
ECON 3204: Macroeconomic Theory ***or*** ECON 3214: Money and Banking	3
Agricultural Economics Elective Courses	12
Restricted and Free Electives	29, 30

B. Environmental Economics, Management, and Policy Option

AAEC 3004: Ag. Production and Consumption Economics	3
AAEC 3304: Rural and Regional Development Policy	3
AAEC 3314: Environmental Law (Area 7, Liberal Education)	3
AAEC 4304: Environment and Sustainable Dev. Economics	3
AAEC 4314: Environmental Economic Analysis and Mgmt.	3
AAEC 4344: Sustainable Development Economics	3
ECON 3204: Macroeconomic Theory ***or*** ECON 3214: Money and Banking	3
ENSC 3604: Fundamental of Environmental Science ***or*** CSES 3604: Fundamentals of Environmental Science	3
GEOL 1024: Resources Geology	3
Additional Option Electives	12
Restricted and Free Electives	30, 31

C. International Trade and Development Option

AAEC 3004: Ag. Production and Consumption Economics	3
AAEC 3204: International Agricultural Development and Trade	3
AAEC 3304: Rural and Regional Development Policy	3
AAEC 3504: Marketing Agricultural Products	3
AAEC 4304: Environment and Sustainable Dev. Economics	3
AAEC 4344: Sustainable Development Economics	3
ECON 3204: Macroeconomic Theory ***or*** ECON 3214: Money and Banking	3
ECON 4135: International Economics	3
IS 2054- 2064: World Politics and Economy	6
Additional Option Electives	9
Restricted and Free Electives	30, 31

D. Community Economic Development Option

AAEC 3004: Ag. Production and Consumption Economics	3
AAEC 3304: Rural and Regional Development Policy	3
AAEC 3314: Environmental Law (Area 7, Liberal Education)* ***or*** AAEC 4304: Environment and Sustainable Dev. Economics* ***or*** AAEC 4314: Environmental Economic Analysis and Mgt.*	3
ECON 3204: Macroeconomic Theory ***or*** ECON: 3214 Money and Banking	3
ECON 4044: Public Economics	3
Additional Option Electives	18
Restricted and Free Electives	30, 31
*Alternative courses available to meet requirement(s). See an AAEC advisor.	

E. Veterinary Business Management Option

Curriculum for Liberal Education, College and Departmental Core

BIOL 1105, 1106, 1115, 1116: Principles of Biology	8
ENGL 1105-1106; or H1204: Freshman English ***or*** Honors English	6
CHEM 1015-1016, 1025-1026: Introduction to Chemistry	8
AAEC 1005-1006: Economics of the Food and Fiber System	6
Ideas, Cultural Traditions, and Values (Area 2, Liberal Education)	6

Creativity and Aesthetic Experience Core (Area 6, Liberal Education)	1
MATH 1525-1526: Elementary Calculus with Matrices	6
ALS 1514: Microcomputers in Agriculture	2
AAEC 3404: Agricultural Financial Management	3
AAEC 3004: Ag. Production and Consumption Economics ***or*** AAEC 3504: Marketing Agricultural Products ***or*** AAEC 3424: Food and Agribusiness Marketing Mgt.	3
AAEC 3454: Small Business Management and Entrepreneurship	3
AAEC 3604: Agricultural Law	3
ENGL 3774: Business Writing	3
STAT 3005-3006: Statistical Methods	6
AAEC 4204: Food and Agricultural Policy	3
AAEC/ECON Electives	6
Required courses, Science:	
ALS 2304: Animal Physiology and Anatomy	4
ALS 3104: Animal Genetics	3
ALS 3204: Animal Nutrition	3
BIOL 4504: Histology	5
BIOL 2604, 2614: Microbiology	4
CHEM 2535-2536, 2545-2546: Organic Chemistry	8
PHYS 2205-2206, 2215-2216: General Physics	8
BCHM 2024: Concepts of Biochemistry	3
Electives	6

F. Financial Planning Option

AAEC 2104: Personal Financial Planning	3
AAEC 3015- 3016: Internship in Agricultural & Applied Economics	1,1
AAEC 3104: Financial Planning for Professionals	3
AAEC 4104: Retirement Planning	3
AAEC 4124: Client Relationship Management	3
AAEC 4134: Financial Planning Applications	3
ACIS 2115- 2116: Principles of Accounting	3, 3
ACIS 3314: Tax Impact on Decisions	3
ACIS 4314: Principles of Taxation	3
FIN 3055: Legal Environment of Business or AAEC 3604: Agricultural Law	3
FIN 3104: Introduction to Finance	3
FIN 3134: Finance Skills and Concepts	3
FIN 3144: Investments: Debt, Equity, and Derivative Markets	3
FIN 3204: Risk and Insurance	3
FIN 4004: Wills, Trusts and Estates	3
Restricted Electives	9
Free Electives	14-16

Satisfactory Progress

By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing and credit by examination), "satisfactory progress" will consist of 1) a grade point average of at least 2.0; 2) at least 24 credits that apply to the Curriculum for Liberal Education, and 3) 9 semester credits of departmental requirements.

TOP

Undergraduate Course Descriptions (AAEC)

1005,1006: ECONOMICS OF THE FOOD AND FIBER SYSTEM
Economic principles that underlie functioning of the U.S. economy in general and the food and fiber system in particular, are developed and applied to analysis of issues important to society. Emphasis on interrelationships of U.S. micro-economic and macro-economics policy, agriculture, and economic well being of world society in terms of availability and price of food and fiber, use of natural resources, and development of rural economics. I,II. (3H,3C)

1005H-1006H: ECON FOOD FIBER SYS
(3H,3C)

2104: PERSONAL FINANCIAL PLANNING
Survey of fundamental personal financial planning needs and decisions of young professionals. Introduction to the personal financial planning needs that special household circumstances or non-traditional household situations may precipitate. (3H,3C)

2244 (AHRM 2244): FOOD AND CLOTHING: CULTURAL TRADITIONS, CONFLICTS AND POSSIBILITIES
Survey of basic ideas underlying human values and cultural traditions expressed in food and clothing. Ethical perspectives in Western and Non-Western schools of thought. Application to issues involving food and clothing, such as product liability, food and clothing safety, animal rights and the use of fur, labor sweatshops, sourcing of inputs, endangered species, rain forests, consumer sovereignty, freedom and economic justice. Sophomore standing required. (3H,3C) II.

2424: COOPERATIVES AND THEIR IMPACT ON THE HUMAN CONDITION
An assessment of the member-owned cooperative organizational structure, including the founding Rochdale Principles (circa 1842) and how these principles and ethics are still prevalent in modern-day cooperatives. Emphasis will be on both agricultural (supply, marketing, service) and non-agricultural (employee-owned, rural electric, housing, child care, health care, crafts, credit unions) cooperatives, with special attention to the impacts on the human condition. I (3H,3C)

2434: FOUNDATIONS IN AGRIBUSINESS
Introduction to the primary management tools as they relate to farm production enterprises and agribusinesses. Principles and concepts of preparing farm and agribusiness financial statements and their analysis. Application of budgeting and risk management. Pre: 1005. (3H,3C)

2464 (REL 2464) (STS 2464): RELIGION AND SCIENCE
Exploration of the relationships between religion and science in the western tradition. Topics include: basic frameworks for relationships between religion and science in historical and cultural context; types of human knowledge and truth; similarities and differences between science and religion; evolution; ecology; and contemporary issues. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: AGRICULTURAL PRODUCTION AND CONSUMPTION ECONOMICS
The economic principles of production. Applications to decision-making and the allocation of resources for the agricultural firm. Consumer behavior and demand for agricultural products. Pre: 1005. (3H,3C) II.

3014: ANALYTIC METHODS APPLIED ECON
Quantitative methods used in applied empirical economic analysis including simple and multiple regression, estimation and application of elasticity, decision analysis, economic simulations, linear programming, and risk analysis. Analysis using spreadsheets stressed. Pre: STAT 3005 or BIT 2405 or STAT 3615. (3H,3C)

3015-3016: INTERNSHIP IN AGRICULTURAL AND APPLIED ECONOMICS
Preparation for, and follow-up to, a practical experience in a selected agricultural, resource, or governmental enterprise, which takes place under the direct supervision of an owner, manager, or supervisor. 3015: offers the student a broad management horizon on understanding the value and the process of setting goals and objectives, and provides methods for evaluating one's abilities, interests, and desires for making career-path choices. 3016: provides a forum for students to share work experiences, discuss human resource issues, and apply the problem solving process to a problem or concern witnessed during the internship. 3015: II; 30I6: I. (1H,1C)

3024: MONETARY GLOB ISS APPLIED ECON
Economics of an open economy and its impact on agricultural and natural resource markets. History of the monetary system, national accounts, balance of payments, fiscal and monetary policy, foreign exchange determinants, trade deficits, international finance, globalization and economic growth. Linkages to agricultural policy and commodity markets stressed. Pre: 1005, 1006. (3H,3C)

3104: FINANCIAL PLANNING FOR PROFESSIONALS
Analysis of financial needs, from the context of the individual, household or small business owner, related to financial situation (cash management and use of debt), income taxes, risk management, retirement planning, investment planning, estate planning, and other special needs. Utilizes mathematical and computing skills. Pre: 2104 or AHRM 2304, FIN 3134 or ACIS 1504. (3H,3C)

3204: INTERNATIONAL AGRICULTURAL DEVELOPMENT AND TRADE

Examination of the role of agriculture in less developed countries and how that role is affected by public policies. Topics include the dimensions of world food, population, and income problems; theories of economic development and the role of agriculture; a description of traditional agricultural systems and their evolution; components of an agricultural modernization strategy; the impacts of international trade and aid; and the effects of international development on U.S. agriculture. I Pre: 1005, 1006. (3H,3C)

3304: RURAL AND REGIONAL DEVELOPMENT POLICY
Analysis of public policy issues and programs for rural America. Emphasis on economic relationships between rural and urban sectors, on economic and social impacts of public programs, and on the process of policy formation. Impact of real property taxation, regional growth, community development and the financing of public services in the rural area will be explored. The relationships between development of resources, growth of the economy, population changes, and the quality of the rural life and environment will be explored. I Pre: 1005, 1006. (3H,3C)

3314: ENVIRONMENTAL LAW
Principles of law involved in environmental issues, survey of environmental litigation, legislation and administrative rulings. Law topics include natural resources, water pollution, private land use, air pollution, toxic substance, food, drug, pesticides, and biotechnology. (3H,3C) II.

3404: AGRICULTURAL FINANCIAL MANAGEMENT
Principles and concepts of preparing agricultural financial statements and their analysis. Application of budgeting and risk management. Time value of money concepts applied to borrowing and investing decisions in agriculture. Pre: 1005, 1006. (3H,3C) II.

3414: FARM, COOPERATIVE, AND AGRIBUSINESS MANAGEMENT
Primary management tools as they relate to farm production enterprises and agribusinesses. Emphasis on comparing and contrasting the cooperative and investor-oriented business. Pre: 1005. (3H,3C) II.

3424: FOOD AND AGRIBUSINESS MARKETING MANAGEMENT
Marketing tools needed to identify and solve the complexity of marketing food and agribusiness products. Emphasis will be on the marketing principles and concepts applicable to the marketing of food and agribusiness products. Contemporary trends, marketing strategies and problems in the food and agribusiness sector. Pre: 1006. (3H,3C) II.

3454 (MGT 3454): SMALL BUSINESS MANAGEMENT AND ENTREPRENEURSHIP
Characteristics of small business and entrepreneurs, and their economic importance. Development and operation of a small business, including concepts and principles such as franchising, business plans, capital acquisition, venture capital, financial and administrative control, marketing, human resource and operations management. Taxation, legal, insurance and ethics in small business. Junior standing required. I (3H,3C)

3504: MARKETING AGRICULTURAL PRODUCTS
Structure of the agricultural marketing system with emphasis on factors determining farm level prices. Emphasis on how markets coordinate consumer desires and producer costs through marketing channels. Impact of market structure, grades, information, product form, and advertising on farm prices. International trade impacts on producers, consumers, agribusiness, and government. I Pre: 1005. (3H,3C)

3514: AGRICULTURAL FUTURES AND OPTIONS
The role of agricultural futures and options in risk management strategies for producers and agribusiness firms and in the price discovery process. Fundamental supply-demand and technical analysis of the markets and pricing processes. Development and applications of effective price risk management strategies. (3H,3C) II.

3604: AGRICULTURAL LAW
Legal problems of farm and agribusiness management.
Practical application of principles of contracts, negligence, debt instruments and commercial transactions of the farm and agribusiness organization. Selected state and federal laws regulating the farm and agribusiness sector; basic animal laws including state and federal regulation of agricultural sector. I (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4104: RETIREMENT PLANNING
Overview of planning needs, products, and strategies used by financial professionals to help businesses, small business owners, and individuals choose and implement an effective retirement plan. Must have prerequisite or permission of instructor. Pre: 3104. (3H,3C)

4124: CLIENT RELATIONSHIP MANAGEMENT
Investigation of socio-psychological factors and communication/interviewing strategies that foster trust-based relationships essential to the success of financial advisors and other financial service professionals. Graduate students are expected to have completed AAEC 3104 or an equivalent course or may enroll with permission of the instructor. Pre: 2104 or 3104. (3H,3C)

4134: FINANCIAL PLANNING APPLICATIONS
Integration of financial planning content in the resolution of client situations in the context of ethical and compliant workplace practices. Utilizes a case analysis approach applying financial planning processes and procedures. Graduate students are expected to have similar background from equivalent courses or professional experience or may enroll by permission of the instructor. Pre: 3104, 4104, FIN 3144, FIN 3204. Co: ACIS 4314, FIN 4004. (3H,3C)

4204: FOOD AND AGRICULTURAL POLICY
Examination of the role of agriculture in developed economies and how agriculture is affected by policy decisions in the public sector. Emphasis will be placed on the economic impacts of policies on the producers and consumers of agricultural products: price supports, food stamps, tariffs and quotas. I Pre: 1005, 1006. (3H,3C)

4304: ENVIRONMENT AND SUSTAINABLE DEVELOPMENT ECONOMICS
Economics of environment and sustainable development. Topics include economic efficiency, property rights, externalities, benefit-cost analysis, economic evaluation procedures, public and private conflicts in land use, water quality, and international growth/development/environmental issues. Pre: 1005 or ECON 2005. (3H,3C) I,II.

4314: ENVIRONMENTAL ECONOMIC ANALYSIS AND MANAGEMENT
Quantitative methods and computer-aided tools used in the economic analysis of environmental/natural resource issues. Economic concepts and analytical tools will be applied to realistic, problem-solving situations. Topics include cost effectiveness analysis, benefit-cost analysis, economic simulations, and statistical analysis. Pre: 4304 or ECON 4014 or FOR 3424. (3H,3C) II.

4334: APPLICATIONS RURAL DEVELOPMENT
Evaluation of policy alternatives and programs for the development of rural areas. Intensive use of analytical techniques, including spreadsheet analysis of trends and changes over time, shift-share analysis of economic change, creation of indices of distribution and poverty for rural areas, creation and use of economic base multipliers, construction, use and interpretation of input-output models. Pre: 1005, 3004. Co: 4324. (1H,1C)

4344: SUSTAINABLE DEVELOPMENT ECONOMICS
Sustainable development concepts are critically explored particular emphasis on implications for domestic and international sustainable development agriculture and for economic development. Students investigate case studies illustrating problems of sustainable development and potential policy solutions. I Pre: (4304 or 3004 or ECON 4014). (3H,3C)

4404: AGRICULTURAL MANAGEMENT AND PROBLEM-SOLVING
Capstone course for students interested in agribusiness management. Application of concepts, tools, and principles including management, finance, marketing, economic theory, and quantitative methods to applied agricultural decisions. Application of knowledge on selected agricultural projects that enhance team-building, written, and oral communication skills. Computer spreadsheet application and senior status. Pre: (3414, 3404, 3504) or (3424, 3604). (3H,2L,4C) II.

4504: AGRICULTURAL PRICE AND MARKET ANALYSIS
Estimation of agricultural supply, demand, and price relationships. Determination of market potential for new products. Students identify problem, collect data, estimate statistical relationship(s), interpret results, and write research report. Use of probability distribution in marketing strategy development. I Pre: 3004, 3504, STAT 3006. (3H,3C)

4514: ADVANCED AGRIBUSINESS MARKETING
Applying concepts, principles, and analytical tools in developing a marketing plan for an existing or new agricultural product or service. Students will define the market, perform competitive marketing analysis, outline market assumptions and objectives, and perform a three-year financial evaluation of the action plan. Course can be repeated once. Co: 3504 or 3004. I Variable credit course. Pre: 3404, 3414, 3424.

4754: REAL ESTATE LAW
The law of real property, legal framework, law of estates in land, conveyancing, landlord-tenant and non-possessory interest in real property. Zoning, easements, restrictive covenants. Mortgages, deeds of trust, and taxation of real estate. Junior standing required. I (3H,3C)

4764: REAL ESTATE APPRAISAL
Application of economic principles to the valuation and appraisal of property. Income, cost and comparable approach to value. Rural property, commercial, residential and transitional will be evaluated. Ethical and professional requirements. Variable lab credit available to meet Real Estate licensing requirements. (Course credits may vary from 3 to 5 hours.) Junior standing required. Variable credit course. II.

4804 (STAT 4804): ELEMENTARY ECONOMETRICS
Economic applications of mathematical and statistical techniques: regression, estimators, hypothesis testing, lagged variables, discrete variables, violations of assumptions, simultaneous equations. Pre: 1006, (STAT 3005 or STAT 3604). (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Agricultural and Extension Education

www.aee.vt.edu/

Rick Rudd, Head
Professors: N. K. Franz; M. T. Lambur; R. D. Rudd
Assistant Professors: H. H. Boyd; T. W. Broyles; E. K. Kaufman; D. M. Moore; K. L. Niewolny; D. A. Trudeau
Research Associate: G. A. Seibel
Adjunct: G. A. Anderson; B. A. Garst; D. W. Reaves; C. M. Sutphin
Emeritus Faculty: S. R. Burke; W. G. Camp; J. P. Clouse; J. R. Crunkilton; J. H. Hillison; A. H. Krebs; M. B. McMillion; J. D. Oliver
Undergraduate Coordinator: E. K. Kaufman (231-6258; ekaufman@vt.edu)

Overview

The Department of Agricultural and Extension Education at Virginia Tech is committed to preparing students for success in professions that apply topical content to social settings. We offer a major in Agricultural Sciences and a minor in Leadership and Social Change. Our Agricultural Sciences graduates will meet the needs of a variety of agricultural employers. In addition, the Agricultural Sciences degree program can prepare undergraduates to enter and excel in graduate and professional programs. The minor in Leadership and Social Change will be of particular interest to students planning to pursue a career in non-profit organizations, including governmental and non-governmental agencies with an agenda for social justice.

Agricultural Sciences Major (AGSC)

The Bachelor of Science in Agricultural Sciences is intended for the individual who wants a strong combination of breadth and depth in agricultural and related subject matter. The agricultural sciences major provides students with the opportunity to tailor curriculum by selecting two minors or concentrations from a list of 19 options in the College of Agriculture and Life Sciences, the College of Natural Resources, and the Department of Biological Sciences.

The Agricultural Sciences course content possibilities include Agricultural and Applied Economics; International Agricultural; Animal and Poultry Sciences; Biochemistry; Biological Systems Engineering; Biological Sciences; Communication; Crop and Soil Environmental Sciences; Dairy Science; Entomology; Environmental Science, Fisheries and Wildlife; Food Science and Technology; Foreign Languages; Forestry; Geography; Horticulture; Human Nutrition, Foods, and Exercise; and Plant Pathology, Physiology, and Weed Science. Courses specifically required for the minor include Communicating Agriculture in Writing (AEE 3624), Communicating Agriculture in Speaking (AEE 3634), Leadership for Professionals in Agricultural Organizations (AEE 3014), and the Agricultural Sciences Seminar (AEE 4044).

Leadership and Social Change Minor (ILRM)

The Leadership and Social Change minor is available to students of all majors across the university. The program embraces a commitment to diversity and an agenda for social change that crosses all programs areas. The minor will be of interest to students planning to pursue a career in non-profit organizations, including governmental and non-governmental agencies with an agenda for social justice. Internships in such organizations are an extremely valuable way for students to gain work-related skills.
The Leadership and Social Change minor requirements include three core classes in leadership theory and practice and three courses from a list of restricted electives. High demand for the leadership courses restricts enrollment to members of Virginia Tech's Residential Leadership Community. For additional information about the minor, contact the Residential Leadership Community office, 231-4469, or Dr. Trudeau, dtrudeaud@vt.edu.

Satisfactory Progress Policy

By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing

and credit by examination), "satisfactory progress"will consist of:

- GPA of at least 2.0
- at least 24 credits that apply to the Curriculum for Liberal Education, and
- at least 9 semester credits of departmental requirements.

TOP

Undergraduate Course Descriptions (AEE)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: EDUCATIONAL PROGRAMS IN AGRICULTURE
Introduction to educational programs in vocational agriculture and extension. (1H,1C)

3014: LEADERSHIP EFFECTIVENESS FOR PROFESSIONALS IN AGRICULTURAL ORGANIZATIONS
Designed to assist students in developing a knowledge and understanding of leadership theory and basic skills required to perform effectively in leadership positions within agricultural community situations.(3H,3C)

3084: AGRICULTURAL METAL FABRICATION
Introduction to metal working tools, equipment, and processes. Fundamentals of hot and cold metal working, plumbing, and welding applications, including inert gas welding processes. Junior standing or consent of instructor is required. (1H,6L,3C)

3624: COMMUNICATING AGRICULTURE IN WRITING
Development of communication skills necessary to deal with the general public and audiences in the food, agriculture, and natural resources fields. Emphasis on writing and on creation of a portfolio including multiple types of written communication. (3H,3C)

3634: COMMUNICATING AGRICULTURE & LIFE SCIENCES IN SPEAKING
Development of strategies and techniques for effective oral communication in the professions related to food, agriculture, and natural resources. Emphasis on oral, visual, and interpersonal communication, as well as on group leadership and meeting management. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4004: TEACHING ADULTS IN AGRICULTURE
Organizing classes, developing programs of instruction and teaching techniques applicable to out of school groups in Agriculture. (2H,2C)

4014: INTRODUCTION TO COOPERATIVE EXTENSION
An overview of the Cooperative Extension Service as it applies to agriculture. Major areas discussed include history, organization, functional areas, responsibilities of local agents, and employment in extension. (3H,3C)

4024: MANAGING AGRICULTURAL SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS
Major emphasis will be given to the agricultural teacher's responsibility for supervision of the Supervised Occupational Experience Program (SOEP). The course will emphasize the ownership project, the cooperative placement project, maintaining record books, and supervising the SOEP. (2H,2C)

4034: METHODS OF PLANNING EDUCATION PROGRAMS FOR AGRICULTURE
Course examines the procedures involved in the development of courses, curriculum, and instructional materials for educational programs in agriculture. Pre: 3004 or 3004. (2H,3L,3C)

4044: AGRICULTURAL SCIENCES SEMINAR
A senior capstone course addressing issues of importance for majors in Agricultural Sciences. The course will emphasize a synthesis of research results from collected data and information on contemporary problems in agriculture and related fields and a sharing of the results. It will emphasize the development of skills in critical analysis, writing, and speaking. Pre: 3624, 3634. (3H,3C)

4054: INTERNSHIP IN COOP EXTENSION
Off-campus participation experience for those preparing to become extension agents in the Cooperative Extension Service. Variable credit; 6-16 credits. Variable credit course.

4064: AGRICULTURAL MECHANICS LABORATORY MANAGEMENT
Plan, organize, and manage secondary school mechanics laboratories. Management of the instructional program, facility, equipment, inventory, safety, liability, personnel, material control, and student/customer work. Pre: 3074, 3084. (2H,3L,3C)

4244: METHODS OF TEACHING CAREER AND OCCUPATIONAL EDUCATION
Developing instructional plans, delivering and evaluating instruction, and evaluating learner performance for career and occupational education. The prerequisite EDCT 4234 will be waived for Agricultural Education students. (3H,3C)

4254: ADULT CAREER AND TECHNICAL EDUCATION
Theory, practices, and procedures involved in planning, developing, implementing, managing, and evaluating adult education programs in Vocational

and Technical Education. Completion of, or concurrent enrollment in, courses in teaching methods and curriculum required. (3H,3C)

4744: METHODS, MATERIALS AND PRACTICES IN INSTRUCTION
Planning, using, evaluating classroom procedures; selection and organization of subject content and materials in vocational and technical education. Maximum credit: 6. Consent required. Variable credit course. X-grade allowed. Co: EDCT 4754.

4754: INTERNSHIP IN EDUCATION
Planned program of clinical practice in education under the direction and supervision of a university supervisor and a selected practitioner. Recommendation of program area and successful completion of Professional Studies required. Variable credit course. X-grade allowed.

4884: YOUTH PROGRAM MANAGEMENT
Organizational design of educational youth programs such as 4-H and FFA, including administrative planning, human resource development, recruitment, marketing, and budgeting. (3H,3C)

4964: FIELD STUDY/PRACTICUM
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Undergraduate Course Descriptions (LDRS)

1015-1016: EXPLORING CITIZEN LEADERSHIP
This two-semester interdisciplinary course offers an introduction to citizen leadership. 1015 explores traditional and contemporary leadership theory and competencies by comparing cultural contexts of leadership. 1016 introduces leadership praxis (action and reflection) as a method of research and service designed to continually refine leadership theory, competencies, and values. Membership in the Residential Leadership Community required. 1015: I; 1016: II (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: THE DYNAMICS OF LEADERSHIP
This course examines advanced leadership theories and leadership effectiveness in today's organizations. This course is restricted to students enrolled in the Residential Leadership Community. Pre: 1015. (3H,3C)

3304: ELEMENTS OF TEAM LEADERSHIP
The focus of this course is to enable students to develop effectiveness in leading, delegating, and communicating within a team environment. An emphasis will be placed on emotional intelligence in teams, team management, and effective team processes. This course is restricted to students enrolled in the Residential Leadership Community. Pre: 1015. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

3984: SPECIAL STUDY
Variable credit course.

TOP

College of Agriculture and Life Sciences

Agriculture and Life Sciences

Susan S. Sumner, Associate Dean and Director of Academic Programs

Overview

The college offers several interdisciplinary courses that are relevant to all university students regardless of their major areas of study. Such courses utilize a cross-section of disciplines throughout the university, thereby providing students with greater academic exposure to current and universal problems. Because of the complexity of subject matter, courses rely upon the diverse expertise of faculty members. Students become familiar with the interdisciplinary approach to studying and realize the necessity of amalgamating their educational experiences to focus on the total program.

The college offers interdisciplinary courses of fundamental subject matter in the departments of animal and poultry sciences and dairy science, which are not restricted to a particular animal species through courses carrying the ALS prefix. These courses are listed as ALS courses under the two departments. Courses primarily designed for a particular animal species, including wildlife species, usually are taught within that particular subject matter department. Courses carrying the ALS prefix are taught by appropriate faculty members or teams of faculty members in more than one department. Academic programs of these departments are thus strengthened by providing professional faculty expertise in essential scientific disciplines that are of equal importance to all students, regardless of their animal species preference.

Other courses taught under the ALS prefix reflect subject matter of college-wide scope and significance which would not appropriately be listed under any one departmental prefix. Appropriate faculty members are selected from among all departments in the college to teach these courses. These courses are listed below.

Undergraduate Course Descriptions (ALS)

1004: AGRICULTURE, THE ARTS AND SOCIETY
Introduction to the relationships among agriculture, society, and the arts, all of which are integral components of civilization. Pass/Fail only. (1H,1C) I, II.

1504: INTRODUCTION TO AGRICULTURE AND LIFE SCIENCES
Concepts and issues important for early orientation of all students considering a career in agriculture and life sciences, and a review of state, national, and international agricultural issues will be covered in relation to majors in the College. I (1H,1C)

1514: MICROCOMPUTERS IN AGRICULTURE
Microcomputer course designed primarily for agriculture students. Emphasis is put on learning the basic skills needed to solve agricultural problems with a microcomputer. Topics include: hardware, electronic spreadsheets, word processors, data base management systems, computer graphics, and communications. (1H,3L,2C) I,II.

2304: COMPARATIVE ANIMAL PHYSIOLOGY AND ANATOMY
Comparative anatomy and physiology of domestic mammals and birds including cell neural, musculoskeletal, respiratory, cardiovascular, urinary, and endocrine systems. Pre: BIOL 1106. (3H,2L,4C)I,II.

2404 (BIOL 2404): BIOTECHNOLOGY IN A GLOBAL SOCIETY
Introduction to the world-wide impact of biotechnology and molecular biology, including applications to plants, animals, and microorganisms. Explores basic concepts of genetic engineering, scientific and ethical issues, and public concerns related to biotechnology. Topics include: environmental release of genetically engineering organisms, bioremediation, safety of genetically engineered food products, transgenic plants and animals, gene therapy, and genetic screening. Pre: (BIOL 1015, BIOL 1016) or (BIOL 1105, BIOL 1106) or (BIOL 1205H, BIOL 1206H), (CHEM 1015, CHEM 1016). (3H,3C) II.

2504: ANIMALS IN SOCIETY
Overview of animal well-being and behavior, human-animal interactions, responsibilities to animals, animal care, behavior, disease and pain

recognition and current topics concerning companion animals, domestic animals and wildlife. (2H,3L,3C) II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: ANIMAL BREEDING AND GENETICS
Principles of genetics related to improvement of domestic farm animals. Molecular, cellular and physiological genetics, estimation of breeding values, selection, heritabilities, genetic correlations, relationships, in-breeding, heterosis, genetic abnormalities. I Pre: BIOL 1105, STAT 2004. (2H,2L,3C)

3134: LIVESTOCK AND THE ENVIRONMENT
Environmental issues associated with animal agriculture. Nutrient contamination of water resources, odor emission from livestock farms, environmental regulations affecting animal agriculture, and management practices to reduce the impacts of livestock farms on air and water quality. II. Pre: BIOL 1005, BIOL 1006 or BIOL 1105, BIOL 1106. (3H,3C)

3204: ANIMAL NUTRITION AND FEEDING
Characteristics, sources, digestion, absorption, and metabolism of water, carbohydrates, lipids, proteins, vitamins, and minerals. Feeding systems for livestock, poultry and companion animals. Pre: 2304, (CHEM 1036 or CHEM 1036H or CHEM 1016). (3H,3C) I,II.

3304: PHYSIOLOGY OF REPRODUCTION
Physiological mechanisms that control and affect reproductive processes in domestic mammals, birds and other selected species. Pre: 2304. (2H,3L,3C)

3954: STUDY ABROAD
Variable credit course.

4404 (GEOG 4404) (NR 4404) (UAP 4404): APPROACHES TO INTERNATIONAL DEVELOPMENT
An introduction to issues relating to international development. The course will focus on areas to help students better understand the interdependencies between countries and how institutions and organizations can foster effective working relationships on global projects of mutual interest between countries. (1H,1C) I.

4504: NATURAL RESOURCE CONSERVATION
Designed primarily to train elementary and secondary teachers, supervisors, and administrators in natural resource conservation. A three-week course. Emphasis is placed on soils, water, geology, forestry, wildlife, and marine life. Available for graduate credit except to agronomy, forestry, and wildlife majors. (3H,3L,4C) III.

4524: FARMING SYSTEMS RESEARCH AND DEVELOPMENT
Characteristics of extensive and intensive farming systems in developing countries. Comparison with U.S. small farming systems. Methods of multi-disciplinary team organization, informal team surveys, grouping farm households, and design and analysis of on-farm trials. Introduction of these methods into developing country and domestic research and extension systems. I (3H,3C)

4554 (BIOL 4554): NEUROCHEMICAL REGULATION
Neurochemical transmission within the vertebrate brain will be examined. Emphasis will be placed on the chemical coding underlying the control of various behaviors and how these systems can be modified by various drugs or diet. Pre: (2304 or BIOL 3404), CHEM 2535. (3H,3C) II.

4574 (BIOL 4574): SOCIAL BEHAVIOR OF BIRDS AND MAMMALS
This course examines origins, influences and implications of social behavior in a variety of avian and mammalian species. Emphasis is placed on understanding group organization and dynamics in inter and intra-species situations. Experimental data from several disciplines (e.g., genetics, physiology, biochemistry) are reviewed to demonstrate their associations with behavioral adaptive mechanisms. Avian and mammalian species living in wild, zoo, agricultural, companion and laboratory settings are discussed. Pre: 3104 or BIOL 2004, BIOL 1106. (3H,3C)

4614 (NR 4614): WATERSHED ASSESSMENT, MANAGEMENT, AND POLICY
Multidisciplinary perspectives of assessment, management and policy issues for protecting and improving watershed ecosystems. Topics include: monitoring and modeling approaches for assessment, risk-based watershed assessment geographic information systems for watershed analysis, decision support systems and computerized decision tools for watershed management, policy alternatives for watershed protection, urban watersheds, and current issues in watershed management. Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FOR, GEOL, LAR, CSES, ENT, BIO, GEOG, AAEC, UAP or equivalent. (2H, 2C). II. (2H,2C)

4964: FIELD STUDY/PRACTICUM
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY

Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Agriculture and Life Sciences

Agricultural Technology Associate Degree Program

Instructors*: S. Doak; J. Guthrie, R. Hensley; T. Martin; P. Mykerezi
Coordinating Counselor: S. Doak; R. Hensley
* In addition, selected faculty members from departments within the College of Agriculture and Life Sciences and the Virginia-Maryland Regional College of Veterinary Medicine teach courses in the program.

Overview

The Agricultural Technology Program offers a concentrated academic experience for individuals pursuing an associate degree in preparation for careers in the agriculture and green industries. Students can specialize in Applied Agricultural Management or Landscape and Turf Management.

Applied Agricultural Management (AAM)

- Beef Production
- Dairy Production
- Horse Management

The AAM specialty provides students with a balanced education – including courses in livestock production and agribusiness – that prepares them for diverse job opportunities.

The animal science curriculum includes courses in genetics, nutrition, reproduction, health, and management. It focuses on the biological and economic aspects of animal production and management. Soils, forages, mechanics and chemical application courses round out the AAM curriculum.

Business courses provide instruction in financial recordkeeping, professional selling, personnel management, strategic marketing, whole business planning, and information systems, focusing on strategic management and economic issues of the agricultural industry. Laboratories stress the use of modern management methods and computer applications for problem solving

Landscape and Turf Management (LTM)

- Golf Course Management
- Landscape Management
- Sports Turf Management
- Horticulture Production

In the LTM speciality, students prepare for a career in the green industry — including landscape design, golf course management, horticulture production and nursery management, and sports turf management. They learn about turfgrass and landscape installation, maintenance, and management.

The LTM curriculum focuses on developing well-rounded students who are in high demand by many branches of the green industry. Students learn about various types of plants, turf management, soils and nutrient management, landscape design, Irrigation and drainage, and Spanish culture and language instruction.

Additional courses are offered in horticulture production, hardscaping, landscape contracting, golf and sports turf management, integrated pest management, and chemical application. Special study classes allow students to work on the Virginia Tech athletic fields and compete in national competitions. A strong core of business courses is also offered. Laboratories for each class focus on hands-on learning and expose students to a range of applied landscape and turf management skills.

Course Requirements for Major

Core Courses	Credits
AT 0104: Computer Applications	3

AT 0114: Applied Ag. Math	3
AT 0144: Communication Skills	4
AT 0184: Plant Biology & Soil Science	3
AT 0194: Ag. Technology Internship	3
AT 0224: Personnel Management	2
AT 0234: Intro. to Agribusiness & Financial Management	3
AT 0274: Strategic Agricultural Marketing & Entrepreneurship	3
AT 0284: Professional Selling for Agribusiness	2
AT 0414: Soils and Nutrient Management	3
AT 0424: Automated Accounting for Agriculture	1
AT 0504: Ag. Technology Survey	1
Requirements for Applied Agricultural Management Option	
Required Courses	9
Restricted Electives	14
Free Electives	10
Requirements for Landscape and Turf Management Option	
Required Courses	28
Electives	10
Total Credits Required	**64**

All students are required to complete an occupational internship for academic credit to provide practical experience in a work environment. The three credit internship lasts for 12 weeks and 480 hours. The internship usually occurs during the summer between the first and second year of the program. Students, in consultation with faculty members, select their own internships that may be located anywhere in the United States or abroad.

All admission offers for this program are made though the Agricultural Technology Program. Foreign language is not a requirement of this program. Recommended high school courses include English, Algebra I and Geometry (minimum), a lab science, and a computer class. Students are encouraged to pursue an Advanced or Standard Diploma from high school. Agricultural Technology students have the same rights and privileges as other students at Virginia Tech, except for membership in the Corps of Cadets and participation in NCAA sports. Selected agricultural technology courses can be transferred to a bachelor's degree program in the College of Agriculture and Life Sciences at Virginia Tech. Bachelor degree students are not permitted to enroll in Agricultural Technology courses.

Satisfactory Progress towards Degree

Students must achieve and maintain a cumulative 2.00 GPA each semester;

All AT courses will be used in the calculation of the GPA.

Undergraduate Course Descriptions (AT)

0104: COMPUTER APPLICATIONS IN THE AGRICULTURAL INDUSTRY
Provides a basic understanding of the operation and use of the micro-computer for farm/firm business management. Stresses the practical applications of Microsoft Office (word processing, spreadsheets, and database management systems, PowerPoint, and Outlook), Adobe Acrobat including PDF Annotator, and OneNote to agricultural production and financial management decisions.
(2H,3L,3C)

0114: APPLIED AGRICULTURE MATHEMATICS
This course will provide students with a background in the mathematical methods and operations used to solve numerical problems arising in soils, dairy, horticulture, landscape, poultry, turf, crops, livestock and feeds. Students will become acquainted with terminology and equations unique to agricultural businesses and enterprises. Emphasis is placed on solving word problems. I (3H,3C)

0124: AGRICULTURAL MACHINERY & MECHANICS
Introduction to the operation and maintenance of internal combustion engines, field machinery, tractor and power units, and shop to include the fundamentals of gas and arc welding. (2H,3L,3C) II.

0144: COMMUNICATION SKILLS
Written and oral communication skills, including business and technical writing, public speaking, and interpersonal communication. Instruction and practice in the application of communication skills for business and agriculture. Emphasis on effective use of word processing and email software.

(3H,2L,4C)

0164: INTRODUCTION TO ANIMAL SCIENCE
Study of animal products, production methods, and management systems for beef, sheep, horses, dairy, swine and poultry. Classroom instruction, demonstrations, and hands-on experience with livestock and poultry. (3H,3L,4C)

0174: FUNDAMENTALS OF TURFGRASS MANAGEMENT
Turfgrass identification, morphology, adaptations, and management systems for parks, lawns, athletic fields, roadsides, and golf courses. Mowing, irrigation, fertilization, soil management, pest management, and other practices that impact turf management. Turfgrass management planning utilizing Integrated Pest Management and Best Management Practices. (3H,3L,4C)

0184: INTRODUCTION TO PLANT BIOLOGY AND CHEMISTRY
Basic botanical and chemical principles and their applications to sound plant production and management practices. Emphasis on practical experiences in laboratory and field settings. (2H,2L,3C)

0194: AT INTERNSHIP
Practical experience in a selected agricultural enterprise, under the direct supervision of owner, manager, or supervisor. Internship will be evaluated by faculty member. Written reports of work experience activities are required. Completion of at least 28 credits with a minimum GPA of 2.00 required. Variable credit course. X-grade allowed.

0224: PERSONNEL MANAGEMENT
Principles and practices in the recruitment, selection, and compensation of employees. Emphasis on employer/employee relationships, including incentive programs. Impacts of safety and environmental concerns on the health and well-being of agricultural employees. (1H,2L,2C)

0234: INTRODUCTION TO AGRIBUSINESS AND FINANCIAL MANAGEMENT
Functions of agribusiness enterprises within the U.S. economic framework. Economic systems, cooperatives, essential elements of business organization, management tools for decision-making, creating financial statements, business planning, development and analysis of budgets, investing in a business, and time value of money. (2H,3L,3C)

0244: AGRICULTURAL LAW AND TAX MANAGEMENT
Principles of law involved in the operation of farm and agribusinesses, emphasizing contracts, land ownership problems, legal liability, leases, tax and inheritance laws. Special topics in areas of land ownership, estates, depreciation and gift taxes of primary importance to the farm and agribusiness firm. Even years. (2H,2L,3C) II.

0274: STRATEGIC AGRIBUSINESS MARKETING AND ENTREPRENEURSHIP
Principles of marketing through the agribusiness industry including the strategic management of products, distribution, promotion, and pricing to improve business performance. Entrepreneurship is explored as a career alternative including methods for acquiring necessary start-up capital. Solving business problems utilizing finance and marketing tools. Pre: 0424. (2H,2L,3C)

0284: PROFESSIONAL SELLING FOR AGRIBUSINESS
Fundamentals of professional selling in the agricultural environment. Preparing and making sales presentations for an agricultural product. Safety and environmental concerns associated with the purchase and/or use of an agricultural product or service. Must be second year student in Agricultural Technology. Pre: 0234, 0274. (1H,2L,2C)

0294: LIVESTOCK MERCHANDISING
A comprehensive study of the principles and activities involved in successfully promoting and merchandising livestock. A livestock auction will be held at the conclusion of the course to provide experiences in advertising, salesmanship, facility development, sale management, and budgeting. Pre: Second year student. I (2H,2C)

0304: MEATS AND ANIMAL PRODUCTS EVALUATION AND PROCESSING
Principles and applications of the evaluation and utilization of animal products of beef, pork, lamb, poultry and dairy origin with emphasis on the conversion of live animals to retail cuts and processed meats and milk into dairy products. (6L,2C) II.

0314: ANIMAL BREEDING AND SELECTION
Fundamental principles of animal genetics applied to the genetic improvement of meat animals, dairy cattle, and horses. Emphasis on trait inheritance, performance testing, selection of replacements, and breeding systems. Must be second year student in Agricultural Technology. I Pre: 0114. (2H,2C)

0324: LIVESTOCK REPRODUCTION
Principles and practices of reproductive management used to maximize reproductive efficiency in dairy and beef cattle, sheep, swine, and horses. Must be second year student in Agriculture Technology. Pre: 0164. (1H,2L,2C) II.

0334: PRINCIPLES OF ANIMAL HEALTH
A general introduction to animal health principles of farm animal species, intended to provide an understanding of the fundamentals of disease processes and animal healthcare. The emphasis is on disease prevention and control rather than on the treatment of disease. Must be second year student in Agriculture Technology. I (2H,3L,3C)

0354: FEEDS AND FEEDING
Principles and practices of livestock feeding. Anatomy and physiology of ruminant and non-ruminant digestive systems. Emphasis on nutrient requirements and ration formulation. Computerized ration formulation and evaluation. (1H,2L,2C) II.

0384: AGRICULTURAL BUILDINGS

Building materials, planning for remodeling, and construction of farm buildings and livestock facilities. Includes electricity and water requirements, maintenance, site selection, and cost effective planning. I Pre: 0114. (2H,3L,3C)

0404: IRRIGATION AND DRAINAGE
Principles applied to solving irrigation and drainage problems. Emphasis placed on hydraulics, irrigation design, irrigation scheduling, and components including heads, valves, controllers, backflow prevention, wire, pipe, and fittings. Pre: 0184. Co: 0114. (1H,2L,2C)

0414: SOILS AND NUTRIENT MANAGEMENT
Physical, chemical, and biological properties of soils; soils' suitability for production of a range of agricultural crops to include turfgrass and landscape plants. Properties of common liming, biosolid, manure, and fertilizer materials with emphasis on their environmental impacts. Soil and plant sampling procedures and the analysis of soil tests. Nutrient management plans. Pre: 0184. (2H,2L,3C)

0424: AUTOMATED ACCOUNTING FOR AGRICULTURE
Financial management principles applied with current technology and information systems to accounting challenges. Emphasis on creating chart of accounts, daily transactions, invoices, financial statements and managing inventory. Pre: 0234. (1H,1C)

0434: PEST MANAGEMENT: INSECTS, DISEASES, AND WEEDS
Identification, classification, and life cycles of economically important insects, plant pathogens, and weeds. Pest management methods: cultural practices, chemical control, biological control, host plant resistance, etc. I (3H,3L,4C)

0474: AGRIBUSINESS TECHNOLOGY AND INFORMATION SYSTEMS
Applies current technology and information systems to key management activities. Emphasis on whole-business planning, evaluation, and problem resolution. Spreadsheet, desktop publishing, document management, and web-development software will be utilized. (2H,2L,3C)

0494: DAIRY MANAGEMENT
Concepts of efficient and profitable management of modern dairy herds. Application of basic principles of business, milking, mastitis control, milk quality, herd replacements, feeding, breeding, reproduction, herd health, housing, and milk marketing management to profitable dairy farming. Pre: 0354. (2H,3L,3C) II.

0504: AGRICULTURAL TECHNOLOGY SURVEY
Orientation to the Agricultural Technology program and resources available at Virginia Tech. Introduction to state, national, and international agriculture; internship requirements; and opportunities and careers in agriculture. (1H,1C)

0514: CONTEMPORARY AGRICULTURAL ISSUES
A survey course designed to acquaint the student with the concerns and critical issues impacting the field of agriculture. Contemporary agricultural issues will be explored. (3H,3C) II.

0544: HORTICULTURE PRODUCTION
Production of vegetable, fruit, flowering, and nursery crops, including propagation of these crops. Focus is on the culture of these commodities as alternative agricultural crops, including environmental and cultural requirements for high quality production. (2H,2L,3C) II.

0554: CHEMICAL APPLICATION
Proper application of pesticides and other agricultural chemicals used in landscape and turf management and in production agriculture; including application methods, equipment calibration and configuration, occupational health and safety, and pesticide laws and regulations. (1H,2L,2C) II.

0564: HERBACEOUS PLANTS
Identification, selection, requirements, and uses of herbaceous plant materials commonly found in landscapes; includes annuals, perennials, bulbs, and grasses. (1H,2L,2C)

0574: WOODY LANDSCAPE PLANTS
Identification and uses of evergreen and deciduous woody plant materials common in the landscape industry; including trees, shrubs, and ground covers; proper plant selection and location in the landscape site. (1H,3L,2C) I.

0594: FORAGES AND GRAIN CROPS
Principles and practices of efficient forage and small grain crop production. Establishment, maintenance, use, and nutritional value of forages will be stressed. (2H,3L,3C) II.

0614: BEEF AND SHEEP MANAGEMENT
Beef cattle/sheep production and management. Emphasis on genetics, nutrition, herd health, reproduction, and marketing to optimize performance and profit. Management and flock decisions based on economic and business principles. Practical experience enhanced through laboratory activities. I X-grade allowed. Pre: 0354. (2H,3L,3C)

0624: HORSE MANAGEMENT
Horse production and management. Emphasis on genetics, nutrition, herd health, reproduction, and marketing to optimize performance and profit. Management decisions based on economic and business principles. Practical experience enhanced through laboratory activities. X-grade allowed. Pre: 0354. (2H,3L,3C) II.

0654: GOLF COURSE DESIGN AND RULES
Principles of golf course design and rules of the game, including: evolution, fairness, progression, hazards, shot value, and safety. The United States Golf Association's rules of golf will be covered. (2H,2C)

0664: GOLF AND SPORTS TURF MANAGEMENT

Management of turfgrass on modified soil. Advanced management techniques and manipulation of nutrition and cultural practices to reduce plant stress or increase plant tolerance. Intensive turfgrass pest identification, life cycles, environmental conditions, and methods of effective control. Integrated pest management and best management practices. Pre: 0174, 0414. (2H,2L,3C)

0674: SPANISH FOR THE GREEN INDUSTRY
Dialogue-based language skills focused on vocabulary and grammatical structures common to agricultural and green industries. Includes vocabulary and contexts specific to activities in greenhouse, nursery, turf, and landscape environments. Elements of Spanish culture are included throughout the course. Pre: Prior study in Spanish is helpful but not required. (3H,3C)

0684: LANDSCAPE DESIGN
Principles and practices involved in the development and interpretation of landscape designs; proper selection and use of landscape construction materials and methods of construction. Introduction to utilizing computer-aided drafting. Pre: 0564. Co: 0574. (2H,3L,3C)

0694: LANDSCAPE CONTRACTING
Interpreting a landscape design and properly installing plant materials. Preparing bids for customers using cost accounting principles. Maintaining and renovating landscapes as well as exploring careers and business opportunities in the landscaping industry. Pre: 0564, 0574. (2H,3L,3C)

0904H: AG TECH HONORS SEM
Exploration of topics in agriculture and related fields that impact and effective and efficient agricultural industry, including professional leadership skills. Special attention will be given to the collaboration and interdependency that the field of agriculture has with other segments of society, including social, political, and economics areas. May be repeated for a maximum of 3 credits and with different topics. (1H,1C) I,II.

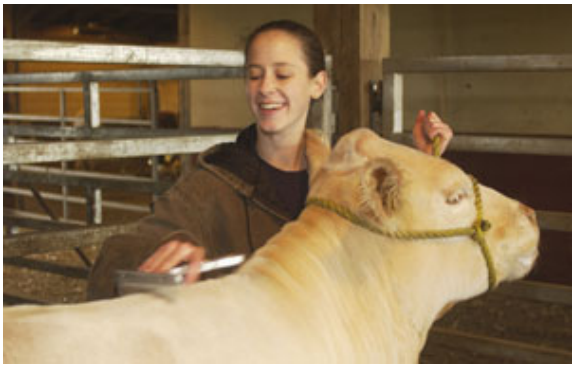
0974: INDEPENDENT STUDY
Variable credit course.

0984: SPECIAL STUDY
Variable credit course.

TOP

College of Agriculture and Life Sciences

Animal and Poultry Sciences



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David E. Gerrard, Department Head
John W. Hancock, Jr., Professor: E. A. Wong
Paul Mellon Distinguished Professor of Agriculture: (not yet announced)
Professors: W. E. Beal; D. M. Denbow; E. A. Dunnington; D. E. Gerrard, A. F. Harper; J.W. Knight; M. A. McCann; D. R. Notter; E. J. Smith; K. E. Webb, Jr.; E. A. Wong
Associate Professors: J. D. Eifert; M. J. Estienne; D. E. Eversole; S. P. Greiner; H. Jiang; R.M.Lewis; A. P. McElroy; R. K. Splan; M. L. Wahlberg; C. M. Wood
Assistant Professors: R. A. Dalloul; J. Escobar
Instructors: T. L. McDonald; J. S. McCann
Lecturer: C. C. Crisman
Career Advisors: D. M. Denbow; E. A. Dunnington, D. E. Eversole

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Overview

Animal and Poultry Sciences provides individuals with a broad science-based education tailored to meet their needs and career goals. The program prepares students for careers in livestock and poultry production, agribusiness, research, and teaching. Our curriculum also provides preparation for professional schools including veterinary medicine, medical school and other health professions, graduate school, etc. This major combines education in the basic sciences of animal and poultry nutrition, genetics, and physiology with management principles as applied to the raising and merchandising of beef cattle, horses, poultry, sheep, swine, and their products. Qualified undergraduates may participate in independent studies, undergraduate research, and summer internship programs. Study abroad opportunities are also available.

Students choose among three options: production/business, science, and pre-vet. Within each option, emphases are offered in the areas of equine, livestock, and poultry. Specific requirements may be obtained from the departmental advising office (540/231-6936), by e-mail (apsc@vt.edu), or on the web at www.apsc.vt.edu.

The department also offers opportunities for graduate specialization in the following fields: behavior, genetics, management, nutrition, and physiology. M.S. and Ph.D. programs are offered (see Graduate Catalog).

Course Requirements

First Year	
Fall Semester	**(15)**
CHEM 1035, 1045: General Chemistry	4
BIOL 1105, 1115: Prin. of Biology	4
STAT 2004: Intro Statistics	3
APSC 1454, 1464: Intro. to An.& Poul. Sci.	4
Spring Semester	**(15)**
CHEM 1036, 1046: General Chemistry	4
BIOL 1106, 1116: Prin. of Biology	4
MATH 1016: College Math	3
APSC 1504: Anim. & Poul. Science Survey	1

ENGL 1105: Freshman English	3
Second Year	
Fall Semester	**(15)**
ENGL 1106: Freshman English	3
AAEC 1005: Economics of Food & Fiber Sys.	3
APSC 2004: Anim. & Poul. Sci. Seminar	1
ALS 2304: Animal Physiology & Anatomy	4
Electives*	4
Spring Semester	**(15)**
AAEC 1006: Economics of Food & Fiber Sys.	3
APSC 3254: Animal Products	3
ALS 3204: Animal Nutrition and Feeding	3
Electives*	6
Third Year	
Fall Semester	**(12)**
ALS 3104: Animal Breeding & Genetics	3
AAEC 2104, 3404, 3454 or MGT 3304	3
Electives*	6
Spring Semester	**(15)**
ALS 3304: Physiol. of Repro. in Dom. Anim.	3
APSC 4004: Contemporary Issues in the Animal Sciences	2
Electives*	10
Fourth Year	
Fall Semester	**(15)**
Choose one (or two):	
APSC 4404: Poultry Management (4)	
APSC 4444: Swine Production (4)	4
APSC 4434: Sheep Production (4)	
Capstone Experience	2
Electives*	9
Spring Semester	**(15)**
Choose one (or two):	
APSC 4414: Beef Production (4)	4
APSC 4424: Horse Production(4)	
Electives*	11 or 12

Note: Advisors work with students to individualize the course of study.

* Electives must include Area 2, Area 6 and Area 7 selections; 27 emphasis requirements & restricted electives approved by your advisor; and free electives.

Satisfactory Progress

By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing and credit by examination) "satisfactory progress" will consist of:

- a grade point average of at least 2.0
- passing at least 24 credits that apply to the Curriculum for Liberal Education
- passing the following:

CHEM 1035, 1036, 1045, 1046

APSC 1454, 1464
At least 7 hours from ALS 2304, 3104 or 3204

TOP

Undergraduate Course Descriptions (APSC) (ALS) (FST) (BMVS)

1454: INTRODUCTION TO ANIMAL & POULTRY SCIENCE
Survey of systems of livestock and poultry production including: concepts and terminology pertaining to management and marketing; types and breeds of livestock and poultry; and an introduction to nutrition, genetics, physiology, and management of beef cattle, horses, sheep, swine and poultry. (3H,3C) I, II.

1464: ANIMAL AND POULTRY SCIENCE LABORATORY
Management practices and concepts related to efficient livestock and poultry production and marketing are taught through demonstrations and hands-on experience. Co: 1454. (3L,1C) I,II.

1504: ANIMAL AND POULTRY SCIENCES SURVEY
Orientation course for new or prospective students in Animal and Poultry Sciences. Explanation of the extension, teaching and research missions of the Animal and Poultry Sciences Department; academic requirements for majors and the planning of each student's curriculum; strategies for academic success; survey of career opportunities for Animal and Poultry Sciences majors. Pass/Fail only. (1H,1C) I, II.

1524: BEGINNING EQUITATION
Introduction to modern forward seat equitation. No previous experience necessary. Familiarization with parts of the horse, tack, gaits. Control at walk, trot, canter, including trot work over rolling terrain. I Pass/Fail only. (4L,1C)

1624: LOW INTERMEDIATE EQUITATION
Increased riding at canter and sitting trot. Control of horse over moderately difficult terrain including galloping. Beginning cavelletti work. Pass/Fail only. Pre: 1524. (4L,1C) II.

2004: ANIMAL AND POULTRY SCIENCES SEMINAR
Identification of primary and secondary career objectives for Animal and Poultry Science majors; planning for completion of a capstone learning experience in the major. Identification of curricular and extracurricular activities to increase career opportunities. Improvement of professional and technical writing skills applicable to the animal sciences field. Pre: 1504. (1H,1C)

2104: POULTRY LABORATORY
Anatomy and physiology of birds including species-specific specializations in anatomical structure and body composition, musculoskeletal, respiratory, reproductive, endocrine, digestive and urinary systems. Relationship of these concepts to growth and egg production. Includes handling live birds. I Pre: 1454, 1464. Co: ALS 2304. (3L,1C)

2114: LIVESTOCK MANAGEMENT AND HANDLING
Safety in livestock handling; animal behavior; care, housing, and managerial practices related to beef cattle, sheep, and swine taught through experiential activities. Pre: 1454, 1464. (3L,1C)

2124: HORSE MANAGEMENT LABORATORY
Principles of safe horse handling practices and applied horse management skills, taught through experiential activities. Pre: 1454, 1464. (2L,1C)

2424: INTRODUCTION TO THE EQUINE INDUSTRY
Introduction to the horse and equine industry. Survey of breeds and conformation; breeding, management, equipment, facilities, and marketing of the successful horse operation. (3H,3C) II.

2464: INTRODUCTION TO COMPANION ANIMALS
Appropriate care and resulting well-being of dogs, cats, and other animals that are used primarily for companionship and recreation require knowledge of their evolution, natural habitats, species and breed characteristics, behavior, breeding, feeding, housing and training. This course integrates these topics to promote a symbiotic human-animal relationship. Information regarding the scope and impact of the companion animal industry will be discussed along with a survey of associated careers. Pre: BIOL 1106. (2H,2C)

2524: INTERMEDIATE EQUITATION
Intermediate work in horseback riding with special emphasis on development of the forward seat and skills required for jumping. Elementary dressage movements. Pass/Fail only. Pre: 1624. (4L,1C) I,II.

2624: BEGINNING EQUITATION OVER FENCES
Introduction of jumping skills for the unskilled as well as review of jumping skills for experienced riders. Rider should have skills at trot and canter. Pass/Fail only. Pre: 2524. (4L,1C) I,II.

2824: EQUINE CONFORM & BIOMECHANICS
Evaluation of equine conformation as related to locomotion, athletic performance and soundness. Basic understanding of breed standards, gaits, and rules and regulations pertaining to various equine sports disciplines, from both domestic and global perspectives. Investigation of current scientific literature regarding equine conformation and biomechanics. (1H,2L,2C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Pass/Fail only. Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3214 (FST 3214): MEAT SCIENCE
Fundamentals of meat science in meat inspection, carcass evaluation, fabrication, fresh meat, processed meat and product preservation on beef, pork, lamb, poultry and seafood. Physical, chemical, physiological, and microbiological properties of meat as related to composition and quality. Fundamentals in processing techniques, product quality assurance, and food safety programs in meat industries. Pre: ALS 2304, CHEM 1036. (2H,4L,4C)

3234: APPLIED RUMINANT NUTRITION
Application of basic principles of nutrition in developing rations for beef cattle and sheep. Emphasis is placed on appropriate use of forages, animal requirements, ration formulation techniques, and development of economic rations to enhance profitability. Pre: ALS 3204. (2H,2L,3C)

3254: ANIMAL PRODUCTS
Products obtained from animals (meat, eggs, dairy, by-products). Effect of production and processing of food animals upon product safety and quality. Pre: ALS 2304. (2H,2L,3C) I, II.

3304: EMBRYOLOGY
Normal and teratological embryology are intensively examined from ovulation through hatching or birth. Environmental, nutritional and genetic factors affecting embryogenesis. Even years. I Pre: ALS 2304 or BIOL 3404. (2H,3L,3C)

3404: POULTRY EVALUATION AND SELECTION
Evaluation and grading of poultry and poultry products; selection of breeding stock; selection for egg production; factors contributing to quality. Pre: 1454. (1H,2L,2C) II.

3464: COMPANION ANIMAL MANAGEMENT
Management of companion animals will be addressed in a comparative fashion, from the perspectives of physiology, anatomy, nutrition, genetics, reproduction and behavior. Interrelationships among these disciplines in the care and wellbeing of companion animals will be emphasized. Normal and aberrant behaviors will be described and techniques of behavior modification and pharmacological intervention will be discussed. To allow in-depth coverage of these topics, the course will be limited to dogs, cats and caged birds. Pre: 2464. (3H,3C)

3524: INTERMEDIATE EQUITATION OVER FENCES
Establishment of sound jumping skills. Continuation of more advanced flat work. Study of hunter courses and cross country jumping. Pass/Fail only. Pre: 2624. (4L,1C) I,II.

3624: ADVANCED EQUITATION OVER FENCES
Advanced methods and techniques for jumping and precision riding. Pass/Fail only.
Pre: 3524. (4L,1C) I,II.

3724: APPLIED EQUINE EVALUATION
In-depth analysis of equine conformation and performance. Emphasis on knowledge of breed standards, critical thinking skills, and oral justification of decisions. Equivalent experience may be substituted for the pre-requisite APSC 2824 with instructor approval. Pre: 2824. (1H,3L,2C)

3754: PRINCIPLES OF LIVESTOCK EVALUATION
Selection of market and breeding animals based on subjective and objective methods of evaluation. Basic understanding of evaluation principles, form-to-function, expected progeny differences, and performance records of beef cattle, swine, and sheep. Involves accurate decision making and oral reason presentations. Pre: 1454. (6L,2C) II.

3764: LIVESTOCK MECHANDISING
A comprehensive study of the principles and activities involved in successfully promoting and merchandising livestock. A livestock auction (Hokie Harvest Sale) is held at the conclusion of the course to provide experiences in advertising, salesmanship, livestock photography, facility development, sale management, and budgeting. Pre: Junior standing or consent. I (2H,2C)

3824: EQUINE BEHAVIOR AND TRAINING
Psychology and ethology of equine behavior. Application of fundamental behavioral concepts to the training of horses and modification of undesirable behavior patterns. Preparation and presentation of young horses for show and sale. Pre: 2124. (1H,3L,2C)

3954: STUDY ABROAD
Variable credit course.

4004: CONTEMPORARY ISSUES IN THE ANIMAL SCIENCES
Applying critical thinking and problem solving to important contemporary issues in animal agriculture and other areas of animal sciences; practice in visual, oral, and written communication. Pre: 2004. (1H,2L,2C)

4054 (BCHM 4054): GENOMICS
A contemporary analysis of the development, utility and application of high-resolution methods for the study and manipulation of the complete

genomes of organisms. The use of new techniques for genomic, metabolic and protein engineering (functional genomics), including high-throughput methods and nanotechnology, will be emphasized. Pre: BCHM 3114 or BCHM 4116 or BIOL 3774.
(3H,3C) II.

4154: ADVANCED ANIMAL GENETICS
Application of selection, mating systems, and molecular biology to genetic improvement of livestock, horses, and poultry in the United States. Description of applied breeding programs from elsewhere in the world. New findings in the inheritance of biological, disease resistance, and behavioral traits. Pre: ALS 3104. (3H,3C)

4404: COMMERCIAL POULTRY ENTERPRISE MANAGEMENT
Production, management, and reproduction of meat- and egg-type chickens and turkeys. Emphasis is on the application of basic poultry science principles as they relate to commercial poultry enterprises. Advanced topics of economic analysis, program management, and problem solving used in decision making processes in integrated poultry operations. Pre: 2104, ALS 3104, ALS 3204, ALS 3304. (3H,3L,4C) I.

4414: BEEF AND SHEEP PRODUCTION AND INDUSTRY
Study of the commercial and purebred beef cattle and sheep industries. Principles and applications for successful and profitable beef and sheep production. Pre: 2114, ALS 3104, ALS 3204, ALS 3304. (3H,3L,4C)

4424: HORSE PRODUCTION AND MANAGEMENT
Reproduction, genetics, nutrition, herd health, planning and economics of private and commercial horse farms, and current issues in the horse industry. Pre: 2214, 2424, ALS 3104, ALS 3204, ALS 3304. (3H,3L,4C) II.

4444: SWINE PRODUCTION
Principles for commercial and seedstock swine production; current management practices, housing and marketing; issues and challenges in the swine industry. Experience in husbandry, research, and other management techniques obtained during laboratory. Pre: ALS 3104, ALS 3204, ALS 3304, APSC 2114. (2H,2L,3C)

4454: LIVESTOCK MANAGEMENT
Overview of livestock production systems; principles of nutrition, reproduction, economics, and breeding and selection of beef cattle, swine, and sheep. For non-majors only. I (3H,3C)

4554: ADV LIVESTOCK ENTERPRISE MGMT
Application of principles needed to manage profitable and sustainable beef cattle, sheep, and swine enterprises. Use of techniques to develop and evaluate strategies resulting in sound livestock enterprise management decisions. Focus on advanced animal management protocols, enterprise analysis, resource allocation, marketing options and risk management. Pre: (AAEC 3404 or AAEC 3454), (APSC 4414 or APSC 4444). (2H,2L,3C)

4954: CAPSTONE EXPERIENCE IN ANIMAL AND POULTRY SCIENCES
Student-defined learning experience that utilizes knowledge and skills already learned to acquire new skills, synthesize information and solve problems in the animal sciences. Requires approval from the department before commencement of the experience, and a final report at its conclusion. Open to APSC majors only. Completion of 75 credits towards the APSC degree required. Variable credit course. Pre: 2004.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Pass/Fail only. Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Pass/Fail only. Variable credit course.

TOP

College of Agriculture and Life Sciences
College of Science

Biochemistry

www.biochem.vt.edu/

P. J. Kennelly, Head
Professors: J.-S. Chen; D. R. Dean; P. J. Kennelly; T. J. Larson; W. E. Newton; M. Potts; Z. Tu
Associate Professors: D. R. Bevan; E. L. Dolan; G. E. Gillaspy; E. M. Gregory; R. F. Helm; J. Li; T. O. Sitz; R. H. White
Assistant Professors: M. Hernick; M. W. Klemba; P. Sobrado; J. Zhu
Adjunct Faculty: D. F. Berry; F. A. Etzkorn; C. Finkielstein; B. Mukhopadhyay; F. D. Schubot; D. T. Zallen
Career Advisor: P. J. Kennelly (231-6315), pjkennel@vt.edu
Undergraduate Coordinatorc: T. O. Sitz (231-6315), tositz@vt.edu and D. R. Bevan (231-6315), drbevan@vt.edu

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Overview

The bachelor of science in biochemistry is designed to provide students with a thorough foundation in chemistry and biology and an appreciation of how these sciences are integrated to explore the molecular mechanisms underlying biological processes. The plan of study prepares students for careers in medicine, veterinary medicine, biomedical research, agriculture, industrial biochemistry, or biotechnology. In addition, it provides the background for post-graduate studies in the life sciences or professional studies in medicine, nursing, veterinary medicine, dentistry, pharmacy, and clinical chemistry.

The department offers the undergraduate biochemistry degree in two colleges, the College of Agriculture and Life Sciences and the College of Science. Biochemistry majors complete the Curriculum for Liberal Education requirements unique to the college in which they are enrolled.

The departmental requirements for majors in either college are: mathematics (9-12 credits); physics (8 credits); principles of biology (8 credits); genetics (3 credits); general microbiology (4 credits); general chemistry (8 credits); organic chemistry (8 credits); physical chemistry (6 credits); analytical chemistry (4 credits); introduction to biochemistry (1 credit); organic biochemistry (1 credit); general biochemistry (7 credits); and laboratory problems in biochemistry and molecular biology (6 credits).

To qualify for a major in biochemistry, the department requires that students maintain a minimum 2.0 grade point average (GPA) for the hours passed in all required biochemistry, biology, and chemistry courses. In addition, the department requires that a student earn a C- or better in all required biochemistry, chemistry, and biology courses.

The plan of study allows time for qualified students to participate in undergraduate research (BCHM 4994). Qualified students are strongly encouraged to initiate research activity prior to their senior year. A minimum GPA of 2.5 is required for enrollment in BCHM 4994. Students participating in undergraduate research are encouraged to present a senior thesis.

Upper-division students who qualify for the Honors Program may participate in the "in honors" degree program in biochemistry. The Honors Program and undergraduate research program include study and research with individual faculty members.

Biochemistry majors may participate in the Cooperative Education Program that alternates academic study with employment experience. Additional information pertaining to the CO-OP program is included in the "General Information" section of this catalog. Summer internships with various businesses and governmental agencies are frequently available, particularly to rising seniors.

Biotechnology Option

Biotechnology is the application of fundamental biochemical and molecular biological approaches to problems in agriculture, medicine, biotechnology, energy, and environmental sciences. The faculty in biochemistry and in several other science departments have developed an interdisciplinary option for undergraduates. To complete the option, Biochemistry majors must also take BCHM 4784 (Biotechnology Applications) and will graduate with a degree in biochemistry with an option in biotechnology. The option will introduce information, concepts, and techniques that are shaping the future of science and our society.

Bioinformatics/Genomics

The department supports students' interest in bioinformatics/genomics by providing instruction and laboratory experience in those areas. Students are advised of appropriate supporting courses in computer science that may be used toward a minor in Computer Science.

The department also offers graduate programs leading to the M.S. and Ph.D.

The minimum number of credits required for the B.S. in Biochemistry is 120.

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Suggested Schedule for Biochemistry Majors

First Year	
First Semester	**(16)**
BCHM 1014: Introduction to Biochemistry[1]	1
CHEM 1055: General Chemistry for Majors[1,5]	4
CHEM 1065: General Chemistry Lab for Majors[1,5]	1
ENGL 1105: Freshman English	3
BIOL 1105: Principles of Biology[1]	3
BIOL 1115: Principles of Biology Lab[1]	1
MATH 1016: Elementary Calculus[2]	3
Second Semester	**(15)**
CHEM 1056: General Chemistry for Majors[1,5]	4
CHEM 1066: General Chemistry Lab for Majors[1,5]	1
ENGL 1106: Freshman English	3
BIOL 1106: Principles of Biology[1]	3
BIOL 1116: Principles of Biology Lab[1]	1
MATH 2015: Elementary Calculus[2]	3
Second Year	
First Semester	**(15)**
CHEM 2565: Principles of Organic Chemistry[1,5]	3
CHEM 2545: Organic Chemistry Lab[1]	1
PHYS 2205: General Physics[1]	3
PHYS 2215: General Physics Lab[1]	1
STAT 3615: Biological Statistics[2]	3
BIOL 2604: General Microbiology[1]	3
BIOL 2614: General Microbiology Lab[1]	1
Second Semester	**(15)**
BCHM 2144: Organic Biochemistry[1]	1
CHEM 2566: Principles of Organic Chemistry[1,5]	3
CHEM 2546: Organic Chemistry Lab[1]	1
PHYS 2206: General Physics[1]	3
PHYS 2216: General Physics Lab[1]	1

Electives[3]	6
Third Year	
First Semester	**(15)**
BIOL 2004: Introductory Genetics[1]	3
BCHM 4115: General Biochemistry[1]	4
CHEM 2114: Analytical Chemistry[1] and	3
CHEM 2124: Analytical Chemistry Lab[1]	1
Electives[3]	4
Second Semester	**(16)**
BCHM 4116: General Biochemistry[1]	3
BCHM 4124: Laboratory Problems in Biochemistry and Molecular Biology[1, 4]	6
Electives[3]	7
Fourth Year	
First Semester	**(15)**
CHEM 4615: Phys. Chem. for the Life Sciences[1]	3
Electives[3]	12
Second Semester	**(15)**
CHEM 4616: Phys. Chem. for the Life Sciences[1]	3
Electives[3]	12

[1] Required course in department major.
[2] The departmental mathematics requirement may be satisfied by taking Math 1015-1016 and 2015 (Elementary Calculus with Trigonometry I & II) and one of the following: Math 2016, or Stat 3615 (Biological Statistics); or Math 1205-1206 (Calculus) and either Math 2016 or Stat 3615.
[3] Electives must include college and Curriculum for Liberal Education requirements.
[4] Enrollment requires "C-" or better in BCHM 4115.
[5] Will also accept: CHEM 1035-1036, CHEM 1045-1046, and CHEM 2535-2536.

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Progress Toward Degree

The following required courses should be completed by the end of the spring semester of the junior year for satisfactory progress toward a bachelor's degree for biochemistry majors in both the College of Agriculture and Life Sciences and in the College of Science.

BIOL 1105, 1106: Principles of Biology; BIOL 1115, 1116: Principles of Biology Lab; BIOL 2604: General Microbiology; BIOL 2614: General Microbiology Lab; BIOL 2004: Introductory Genetics; CHEM 1035, 1036: General Chemistry or CHEM 1055, 1056: General Chemistry for Majors; CHEM 1045, 1046: General Chemistry Lab or CHEM 1065-1066: General Chemistry Lab for Majors; CHEM 2535, 2536: Organic Chemistry or CHEM 2565, 2566: Principles of Organic Chemistry; CHEM 2545, 2546: Organic Chemistry Lab; PHYS 2205, 2206: General Physics; PHYS 2215, 2216: General Physics Lab.

Requirements for Minor in Biochemistry

CHEM 2114, 2124: Analytical Chemistry	4
CHEM 2535-2536: Organic Chemistry or CHEM 2565-2566 Principles of Organic Chemistry	3, 3
CHEM 2545-2546: Organic Chemistry Laboratory	1, 1
BCHM 4115-4116: General Biochemistry	4, 3
BCHM 4124: Laboratory Problems in Biochemistry and Molecular Biology	6
or BCHM 3124: Biochemical Techniques for Biotechnology and the Life Sciences	3

To qualify for a minor in biochemistry, the department requires that the student maintain a minimum 2.0 Grade Point Average (GPA) for the hours passed in all required biochemistry and chemistry courses. Furthermore, the department requires that a student earn a C- or better in

the following courses: BCHM 4115-4116 (General Biochemistry), BCHM 4124 (Laboratory Problems in Biochemistry and Molecular Biology) or BCHM 3124 (Biochemical Techniques for Biotechnology and the Life Sciences), and Chem 2535-2536 (Organic Chemistry) or CHEM 2565-2566 (Principles of Organic Chemistry).

Undergraduate Course Descriptions (BCHM)

1014: INTRODUCTION TO BIOCHEMISTRY
History and evolution of biochemistry; applications of biochemistry in agricultural and life science disciplines; topical research areas in biochemistry; educational requirements and career opportunities for biochemistry majors. I Pass/Fail only. (1H,1C)

2024: CONCEPTS OF BIOCHEMISTRY
Short course in fundamentals of the chemistry of living systems. Introduction to major categories of biochemical substances, metabolic pathways, and principles of biochemical information transfer. (No credit for majors). Pre: CHEM 2514 or CHEM 2535. (3H,3C) II.

2144: ORGANIC BIOCHEMISTRY
Organic chemistry of the fundamental structures and reactions encountered in biological chemistry. Chemical description of carbohydrates, amino acids, lipids, proteins and nucleic acids. Discussion of organic chemical reactions that describe the majority of reactions encountered in biological chemistry. Pre: CHEM 2535 or CHEM 2565. Co: CHEM 2566, CHEM 2536. (1H,1C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114: BIOCHEMISTRY FOR BIOTECHNOLOGY AND THE LIFE SCIENCES
Survey presentation of the basic principles of biochemistry as they apply to biotechnology. Topics covered include protein structure, enzymology, cellular organization, and biochemical regulation. Special emphasis will be given to gene structure, transcription, and translation, cellular organization, and cloning, sequencing, modification and expression of recombinant DNA. Examples will be given of agricultural/medical/industrial applications of cellular and molecular biochemical knowledge. Non-majors only. I Pre: CHEM 2536. (3H,3C)

3124: BIOCHEMICAL TECHNIQUES FOR BIOTECHNOLOGY AND THE LIFE SCIENCES
Survey of basic biochemical laboratory techniques for students interested in biotechnology, genetic engineering, and the modern life sciences. Topics include the use of buffers, spectroscopy, enzyme assays, chromatography, electrophoresis, and immunoassays in the analysis of biological macromolecules. (Non-majors only). I Co: 3114. (2H,3L,3C)

4034 (BMVS 4034): ENVIRONMENTAL HEALTH TOXICOLOGY
Health effects associated with the exposure to chemicals, identifying and managing problems of chemical exposure in work places and the environment, fundamental principles of biopharmaceutics and toxicokinetics, and risk assessment. Emphasis on conceptual understanding of chemical entry into the body, biotransformation, multiple chemical sensitivity, and chemically induced diseases. Identification of nutrient interactions with environmentally induced disorders and to understand the mechanisms of such interactions and their influence on human health and welfare. Pre: BIOL 2104 or BIOL 3124, ALS 2304, BIOL 2406 or BCHM 3114 or BCHM 4115, BCHM 4116. (3H,3C)

4054 (APSC 4054): GENOMICS
A contemporary analysis of the development, utility and application of high-resolution methods for the study and manipulation of the complete genomes of organisms. The use of new techniques for genomic, metabolic and protein engineering (functional genomics), including high-throughput methods and nanotechnology, will be emphasized. Pre: 3114 or 4116 or BIOL 3774. (3H,3C) II.

4074: CAREER ORIENTATION
Examination of various career opportunities for biochemists in industry, academia, medicine and related health sciences. Introduction to resources for locating career opportunities, resume preparation and interview skills. Restricted to biochemistry majors and minors. Junior standing required. I Pass/Fail only. Co: 4115. (1H,1C)

4115-4116: GENERAL BIOCHEMISTRY
Metabolism and chemistry of carbohydrates, proteins, lipids, and nucleic acids with emphasis on interactions and comparative aspects of microbial, plant, and animal forms. For students in the biochemistry curriculum and other students interested in a foundation course. (Students are required to have at least a C- in both Chem 2535 and 2536 to be admitted to BCHM 4115). Pre: CHEM 2536 for 4115; 4115 for 4116. 4115: (4H,4C) 4116: (3H,3C) I,II.

4124: LABORATORY PROBLEMS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY
Presentation of major analytical techniques of importance to biochemistry and molecular biology, including spectrophotometry, electrophoresis, chromatography, and use of radioisotopes. Lab study of selected principles and methods used in biochemistry and molecular biology. Pre: 4115, (CHEM 2114, CHEM 2124) or (CHEM 3114, CHEM 3124). Co: 4116. (3H,9L,6C) I,II.

4754: INTERNSHIP
Variable credit course.

4784 (BIOL 4784): BIOTECHNOLOGY APPLICATIONS
Covers medical, agricultural, environmental and industrial biotechnology and their ethical, legal and social implications. Includes the commercial exploitation of microbes, plants, and animals, plus safety of the food supply, conservation genetics, use in forensic science, patent laws, and the

regulations governing biotechnology in the U.S. and overseas. Does not count as Biology elective for biology majors/minors. Pre: (3114, 3124, BIOL 3774, BIOL 4774) or (BCHM 4116, BCHM 4124). (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Science Programs of Study
Biochemistry | Biology | Chemistry | Economics | Geosciences | Mathematics | Physics | Psychology | Statistics

College of Agriculture and Life Sciences

Biological Systems Engineering

www.bse.vt.edu/

University Exemplary Department
S. Mostaghimi, Head and H.E. and Elizabeth F. Alpin Professor
M. L. Wolfe, Assistant Head for Teaching
Professors: J. S. Cundiff; T. A. Dillaha; R. D. Grisso; S. Mostaghimi; D. H. Vaughan; M. L. Wolfe
Associate Professors: F. A. Agblevor; J. R. Barone; B. L. Benham; C. D. Heatwole; W. C. Hession; K. Mallikarjunan; C. Zhang
Assistant Professors: J. Arogo Ogejo; D. J. Sample; D. Scott; R. S. Senger; Z. Wen; T. G. Wynn; Y. Zhang
Instructor: S. C. Mariger

Overview

The mission of the Department of Biological Systems Engineering (BSE) is to provide the engineering expertise for a sustainable food, fiber, and bioprocessing industry in the state and throughout the world through its teaching, research and extension programs.

The teaching program in BSE offers engineering B.S., M.S., and Ph.D. programs and service courses for students enrolled in the College of Agriculture and Life Sciences and other colleges. The degree programs in BSE are administered by the College of Engineering. Therefore, the curriculum and courses offered for the B.S. in biological systems engineering are listed in the College of Engineering section of this catalog. Students interested in pursuing an undergraduate degree program in Biological Systems Engineering must first be admitted to the College of Engineering.

Service courses designed to meet the needs of students enrolled in different programs in CALS are listed in the following section. These courses generally are not taken to meet engineering degree requirements except as free electives.

TOP

Undergraduate Course Descriptions (BSE)

Courses for Non-Engineering Students
(See College of Engineering for courses for engineering students)

2094: INTRODUCTION TO METAL FABRICATION
Introduction to metal working tools, equipment, and processes. Fundamentals of gas and arc welding. (3L,1C) I,II.

2294: ANIMAL STRUCTURES AND ENVIRONMENT
Functional considerations in facilities development for production agriculture. Concepts of farmstead planning and system development emphasized. Techniques for providing production animal environment, especially for confinement facilities. Pre: MATH 1016. (3H,3C) I,II.

2384: SOIL AND WATER RESOURCES MANAGEMENT
Fundamental principles involved in the management of soil and water resources are presented. Emphasis is placed on the planning and management of irrigation systems and the control of soil erosion on agricultural lands. Non-engineering students. I Pre: MATH 1016. (3H,3C)

2484: ENGINE AND POWER TRAIN TECHNOLOGY
Fundamentals of the construction and operation of current internal combustion power units. Control of power utilizing clutches, transmissions, drive shafts, and differentials. Pre: MATH 1016. (2H,3L,3C) I,II.

2494: AGRICULTURE POWER AND MACHINERY
The function, selection, operation, adjustment, and economic management of tractors and field machinery. Pre: MATH 1016. (3H,3C) I,II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4324: NONPOINT SOURCE POLLUTION
Engineering aspects of the sources and magnitudes of nonpoint source pollution, major causative factors, and control techniques. Emphasis on hydrologic factors, erosion, atmospheric deposition, adsorption and degradation of pollutants in soil, disposal of agricultural wastes, and management for the control of urban and agricultural nonpoint source pollution. Pre: CEE 3104. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Agriculture and Life Sciences

Crop and Soil Environmental Sciences

http://www.cses.vt.edu/

James R. McKenna, Interim Head
W. G. Wysor Professor: M.M. Alley
Professors: J. A. Burger[1]; W. L. Daniels; S. K. De Datta; G. K. Evanylo; C. A. Griffey; C. Hagedorn; S. C. Hodges; J. R. McKenna; D. J. Parrish; M. A. Saghai Maroof
Associate Professors: A. O. Abaye; D. F. Berry; M. J. Eick; E. H. Ervin; J. H. Fike; J. M. Galbraith; D. Holshouser; N. Persaud; C. D. Teutsch; B. F. Tracy; C. A. Wilkinson; C. E. Zipper
Assistant Professors: R. O. Maguire; K. M. Rainey; M. S. Reiter; W. E. Thomason
Affiliate Professor: A. Pereira
Adjunct Professors: R. F. Follett; J. E. Perry, III; P. J. Thomas; R. W. Tiner; M. J. Vepraskas
Instructor: S. O. Doak
Career Advisor and Coordinating Counselor: A. O. Abaye (231-9737; cotton@vt.edu)
[1]Joint appointment with Forestry.

Overview

This broad discipline deals with crop production, utilization of soils, and stewardship of the environment. It is concerned with feeding the world, protecting the environment, and producing quality turfgrass. Graduates include professionals who monitor and work to improve water quality, who serve as agricultural loan officers for banks, who develop environmentally acceptable methods for protecting crops from pests, who advise municipalities on use of the land resource, and who maintain the greens and fairways at golf courses.

Graduates' familiarity with fundamentals of soil, plant, and environmental sciences prepares them for careers ranging from integrated pest management to international development, from environmental legislation to biotechnological investigation, from cash cropping to city planning. Students find employment in agribusiness (e.g. agricultural sales and consulting), soils-related activities (such as soil conservation and land-use planning), and other areas of environmental concern (e.g., biological control of pests and water quality assessment/control), as well as crop production (such as turf maintenance and farm management).

Because of its breadth and diversity, the crop and soil environmental sciences major is divided, for advising and curricular purposes, into five undergraduate options.

Agroecology Option

Students in this option concentrate on the biology and increasingly complex technology of food, feed, fuel, and fiber production. Graduates typically move into farming or into sales, consulting, and managerial positions that directly and indirectly support agricultural production, a most vital component of the U.S. economy.

Biotechnology and Genetics Option

Producing better quality and higher yielding crops has always been an objective of crop breeders. New techniques of genetic engineering are now being brought to bear on crop improvement. Students in this option learn the newest methods of biotechnology and are well prepared for careers in research and industry.

International Agriculture Option

The world's ever-expanding population must be fed; at the same time, we must be good stewards of the Earth's resources. Many countries have not been able to bring food production and resource conservation into balance. Students in the International Agriculture option are interested in finding simultaneous solutions to these concerns. Employment opportunities exist with various private and public agencies.

Soil-Environmental Option

Human impacts on the environment and good stewardship of the soil and land resources are major focuses of this option. Graduates find positions with governmental agencies and private industry. They may deal with concerns such as soil conservation, groundwater pollution, land-use planning, waste management, and reclamation.

Turfgrass Management Option

Using basic principles of the natural sciences and agricultural technology, turf managers have skills that make them highly employable in golf-course management, athletic and recreational fields, lawn maintenance services, the landscaping industry, and sod production.

Requirements for a Major

All the curricula for the various options contain a core of courses to assist the student in developing knowledge and ability in basic sciences (biology and chemistry), computational skills (mathematics and statistics), communication skills (both writing and speaking), as well as crop, soil, and environmental sciences. A list of courses specified for each option may be obtained upon request from the department or at www.cses.vt.edu. In the following listing, semester hour credits are shown at the right.

Core Curricular Requirements (All Options)	
Agricultural Economics/Economics	6
Biology	6
Chemistry	8
Communications	3
Creativity and Aesthetic Experience (Area 6)	1/3
Crop and Soil Environmental Sciences	14
English	9
Ideas, Cultural Traditions, and Values (Area 2)	6
Mathematics	6
Statistics	3
Some Option-Specific Course Requirement and Electives	
Agricultural and Applied Economics (in addition to above)	0-9
Biochemistry	0-9
Biology (in addition to above)	0-18
Chemistry (in addition to above)	3-8
Crop and Soil Environmental Sciences (in addition to above)	6-21
Entomology	0-6
Geology	0-4
Horticulture	0-8
Physics	0-3
Plant Pathology, Physiology, and Weed Science	0-11
Total Credits for B.S. Degree (minimum)	**120**

TOP

Requirements for a Minor

The department offers a minor in crop and soil environmental sciences. The requirements include CSES 2444 (or 3444), 3114 and 3124 (or 3134) and 12 or 13 more credit hours selected from a set of 21 courses from within and outside the department. Consult the department

office (240 Smyth) or web site (www.cses.vt.edu) for more information on a minor.

Satisfactory Progress

By the end of the academic year in which the student has attempted 60 hours (including transfer, advanced placement, advanced standing and credit by examination) "satisfactory progress" will include meeting the following minimum criteria:

- having a grade point average of at least 2.0
- passing at least 24 semester credits that apply to Curriculum for Liberal Education
- passing the following:

  CHEM 1035, 1036, 1045, 1046
  CSES 1004 or 1054
  CSES 3114 and 3124
  6 hours of MATH and/or STAT

- declaring an option within CSES

Opportunities to Excel

Students with outstanding records can qualify for the Honors Program and graduate "in honors" in crop and soil environmental sciences. Other opportunities for personal and professional growth and for recognition include department-sponsored agronomy and turf clubs, membership in Alpha Zeta and Gamma Sigma Delta or other honoraries, and several scholarships. B.S. graduates are certifiable in the professional registry of the American Society of Agronomy.

Graduate courses and research opportunities lead to M.S. and Ph.D. specializations in soil mineralogy, soil microbiology, soil chemistry and biochemistry, soil morphology and genesis, soil physics, soil and crop management, soil fertility, biotechnology, bioremediation, crop breeding, crop ecology, crop physiology, and seed physiology. (See the Graduate Catalog for more information.)

Undergraduate Course Descriptions (CSES)

1004: INTRODUCTION TO CROP AND SOIL ENVIRONMENTAL SCIENCES
An overview of crops, soils, and environmental studies. Emphasis placed on career aspects of crop science, soil science, turf management, environmental studies, and plant biotechnology and genetics. I Pass/Fail only. (1H,1C)

1054: INTRODUCTORY CROP AND SOIL ENVIRONMENTAL SCIENCES LABORATORY
Laboratory and field familiarization with Virginia's major crops and soils; the biology of crops as it relates to their management; consideration of agronomically important properties of soils and soil profiles. (3L,1C) II.

2434: CROP EVALUATION
Identification of more than 200 crops, weeds, seeds and crop diseases. Seed testing for purity according to the rules of the Association of Official Seed Analysts. Crops graded according to the official USDA grain grading standards. (6L,2C) I,II.

2444: AGRONOMIC CROPS
An introduction to crop production in Virginia, presenting basic climatic, crop, and soil characteristics and their relation to cropping systems. Introduces basic mechanical, chemical, and managerial tools of crop production and examines feed quality and seed and forage storage. I (3H,3C)

2564: TURFGRASS MANAGEMENT
Growth, development, adaptation, and selection of the major turfgrass species. Principles of establishment, mowing, nutrition, irrigation, cultivation, and pest control of lawns and utility turfs. Co: BIOL 1105. (2H,3L,3C) I.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3114 (ENSC 3114) (GEOS 3614): SOILS
Characterization of soils as a natural resource emphasizing their physical, chemical, mineralogical, and biological properties in relation to nutrient availability, fertilization, plant growth, land-use management, waste application, soil and water quality, and food production. For CSES, ENSC, and related plant-and earth-science majors. Partially duplicates 3134. Pre: CHEM 1036. Co: 3124. (3H,3C) I.

3124 (ENSC 3124) (GEOS 3624): SOILS LABORATORY
Parent materials, morphology, physical, chemical, and biological properties of soils and related soil management and land use practices will be studied in field and lab. Partially duplicates 3134. Co: 3114. (3L,1C) I.

3134 (ENSC 3134): SOILS IN THE LANDSCAPE
A study of soils as functional landscape components, emphasizing their physical, chemical, mineralogical, and biological properties in relation to plant growth, nutrient availability, land-use management, and soil and water quality. Primarily for FOR/FIW, LAR, and other plant/earth science related majors. May not be taken by CSES or ENSC majors. Partially duplicates 3114 and 3124. Pre: one year of introductory CHEM or BIOL or GEOS. (2H,3L,3C) II.

3144: SOIL DESCRIPTION AND INTERPRETATION
Describing, classifying, evaluating, and interpreting soil and site properties in the class and field. Local field trips supplement lecture and laboratory studies. Required for students interested in attending soil judging contests. Co: 3124, 3114. (1H,6L,3C)

3304 (GEOG 3304) (GEOS 3304): GEOMORPHOLOGY
Examines the variety of landforms that exist at the earth's surface. Detailed investigation of major processes operating at the earth's surface including: tectonic, weathering, fluvial, coastal, eolian, and glacial processes. Field excursion. Pre: GEOG 1104 or GEOS 1004 or GEOS 2104. (3H,3C)

3444: WORLD CROPS AND CROPPING SYSTEMS
An introduction to world crops, their primary regions of production, the factors that determine where they are grown, and their economic importance. Describes the various factors that can be managed to improve crop yields. Examines present and potential systems of farming for improved crop production in the major climatic and soil ecosystems of the world. Junior standing required. (3H,3C) II.

3564: GOLF AND SPORTS TURF MANAGEMENT
Principles of turfgrass science and culture required for successful establishment and management of intensely utilized fine golf and sports turf surfaces. Pre: 2564. (3H,3C)

3604: FUNDAMENTALS OF ENVIRONMENTAL SCIENCE
Interrelationships between human activities and the environment; provides national and global perspective; emphasis on the physical, chemical, and biological principles and processes that are essential to an understanding of human-environment interactions; land, water, and atmospheric resources; the role of energy in human and natural systems; environmental legislation and human behavior. Junior standing and completion of SCIENTIFIC REASONING AND DISCOVERY CORE required. (3H,3C) II.

3634 (ENSC 3634): PHYSICS OF POLLUTION
Physical processes that control the fate of pollutants in our land, air, and water resources. Types and sources of pollutants, physical processes in the soil-water-atmosphere continuum controlling the dispersion and deposition of pollutants, the movement of pollutants, including radionuclides, by surface and subsurface water flow in soils, and physics of disturbed soils. I Pre: 3114, PHYS 2206, MATH 2016. (3H,3C)

3644 (ENSC 3644): PLANT MATERIALS FOR ENVIRONMENTAL RESTORATION
Overview of ecological principles related to revegetation and restoration of disturbed sites. Function and species requirements of plants in stabilizing disturbed areas including mines, rights-of-way, constructed wetlands, and for the remediation of contaminated soils. I Pre: BIOL 1106. Co: 3114. (3H,3C)

4004: SENIOR SEMINAR
The job market, placement, and professional ethics within crop and soil environmental sciences, and consideration of topics of current interest in the major. Majors only. Senior standing required. I (1H,1C)

4114 (ENSC 4114): SOIL PHYSICS
Application of the principles of physics and mathematical analysis to the study of soils. Covers the physical nature and properties of soil solids, basic soil mechanics, physical state of water in soils, infiltration and movement of water in soils, mass transport in soil solutions, soil gases and soil aeration, heat and heat transfer in soils. I Pre: 3114, PHYS 2205, MATH 2015. (3H,3L,4C)

4124: SOIL SURVEY AND TAXONOMY
Identification and evaluation of soil morphological characteristics; techniques for writing soil map and taxonomic unit descriptions; characterization and delineation of soil landscapes into discrete soil map units on an aerial photographic base; classification of soil taxonomic units by criteria of the National Cooperative Soil Survey. Co: 3114 or 3124. I (1H,6L,3C)

4134: SOIL GENESIS AND CLASSIFICATION
The form and dynamics of soil bodies across the landscape; soil-forming factors and processes; state factor analysis as a predictive tool to explain the evolution of unique soils across the terrain; diagnostic horizons and other important pedological features used in Soil Taxonomy; history and development of soil classification systems. Taught even years. Pre: 4124. (3H,3C) II.

4144: PLANT BREEDING AND GENETICS
Genetic variation in plants and its importance in plant breeding, and comparisons of theories and procedures in breeding of self-pollinated versus cross-pollinated plants. Taught even years. (2H,3L,3C) II.

4164 (BIOL 4164) (CEE 4164) (ENSC 4164): ENVIRONMENTAL MICROBIOLOGY
Ecology, physiology, and diversity of soil and aquatic microorganisms;incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in

natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Pre: BIOL 2604. (2H,3L,3C) II.

4214: SOIL FERTILITY AND MANAGEMENT
Soil productivity and nutrients required for crop growth; fertilizer sources and nutrient reactions in soil; methods of fertilizer nutrient placement in major tillage systems; and interpretation of soil tests and plant analyses for determining crop nutrient requirements. I Pre: 3114. (3H,3C)

4224: SOIL FERTILITY AND MANAGEMENT LABORATORY
Determination of essential elements for plant growth in soils and plants. Techniques for obtaining representative soil and plant samples. Comparison of soil test methods and interpretation of results and instrumentation utilized in analytical work. I Co: 4214. (3L,1C)

4334 (FOR 4334): PRINCIPLES AND PRACTICE OF AGROFORESTRY
Biological, social, economic, and technical aspects of agroforestry, training and technology transfer techniques, and application of forestry and agriculture principles. Roles of animals and fish, trees, and agricultural crops in agroforestry systems. Community involvement in planning and implementation of agroforestry projects. I (3H,3C)

4344: CROP PHYSIOLOGY AND ECOLOGY
Developmental and ecological processes important in cropping situations: seed physiology, root and canopy development, flowering, water stress, energy flow, competition; emphasis on physiological adaptations, limitations to yield, and yield-optimizing strategies. (3H,3C) II.

4444: ADVANCED CROP MANAGEMENT
Analysis and evaluation of conventional and alternative crop management systems; natural resource problems associated with agriculture; directions of crop management research and science; low-input, sustainable agriculture. Pre: 2444, 3114, 3124. (3H,3C) II.

4524: AGROMETEOROLOGY
In-depth, quantitative treatment of weather in relation to crop production. Covers physical basis for global weather and weather patterns, measurement of weather elements, analysis and interpretation of weather data series, quantifying the influence of weather on crop growth and development, estimating dynamic energy and water balance of field crops using weather data series, soil heat transfer, and bio-physical crop models. Pre: 4344. (3H,3C)

4544: FORAGE CROP ECOLOGY
Species adaptation interrelated with soil, climatic, and biotic factors as associated with establishment, production, utilization, and nutritional value of forages. Pre: ALS 3204. (3H,3C) II.

4564: INTEGRATED MANAGEMENT OF TURF SYSTEMS
Requires students to develop an integrated turf management plan for a case-study golf course, athletic field complex, sod farm, or commercial lawn care operation. A significant part of this plan will be in agronomic programming, material selection, application schedules, and budgeting. Prerequisite and senior standing are required. I Pre: 3564. (2H,2C)

4594 (CEE 4594): SOIL AND GROUNDWATER POLLUTION
Application of mathematical models for chemical movement in soils and groundwater to evaluate soil and groundwater pollutant behavior; discussion of pollution remediation technologies; design of subsurface monitoring networks; case studies in soil and groundwater pollution; applications to landfills, waste spills, septic drainfields, pesticide/fertilizer leaching, and other problems of environmental concern. Pre: MATH 2224, (GEOL 4114 or CEE 4314). (3H,3C) I,II.

4644: LAND-BASED SYSTEMS FOR WASTE TREATMENT
Soils as a medium for waste treatment; potential for environmental degradation from biologicals and chemicals added to soils; development of land-based treatment and utilization systems for solid and liquid wastes; issues and concerns relating to large-scale applications of municipal and industrial wastes to land. Taught odd years. (3H,3C) II.

4734 (CHEM 4734) (ENSC 4734): ENVIRONMENTAL SOIL CHEMISTRY
Chemistry of inorganic and organic soil components with emphasis on environmental significance of soil solution-solid phase equilibria, sorption phenomena, ion exchange processes, reaction kinetics, redox reactions, and acidity and salinity processes. I Pre: 3114, 3124, CHEM 2514 or CHEM 2535, CHEM 3114, MATH 2015. (3H,3C)

4754 (CHEM 4754) (ENSC 4754): INSTRUMENTAL ANALYSIS FOR AGRICULTURAL AND ENVIRONMENTAL SCIENCES
Theory and principles of common analytical instruments and their applications to agriculture and environmental science research. Topics include atomic absorption and emission spectroscopy, spectrophotometric methods (UV, visible, luminescence, and automation), chromatography, ion-selective electrodes, and microwave digestion. Infrared spectroscopy, atomic ratio and molecular mass spectroscopy, nuclear magnetic resonance will also be included. Provides hands-on experience with modern analytical instruments. Prerequisites or graduate standing required. Pre: (CHEM 3114, CHEM 3124) or (CSES 3114, CSES 3124). (3H,3L,4C) II.

4774 (ENSC 4774): RECLAMATION OF DRASTICALLY DISTURBED LANDS
Remediation, rehabilitation, and revegetation strategies for lands disturbed by mining, construction, industrialization, and mineral waste disposal. Disturbed site characterization and material analysis procedures. Regulatory and environmental monitoring frameworks for mining sites and other disturbed lands. Prediction and remediation of water quality impacts from acid drainage. Pre: 3114 or GEOS 3614 or ENSC 3114 or CSES 3134 or ENSC 3134 or CSES 3304 or GEOG 3304 or GEOS 3304. (3H,3C)

4854 (ENSC 4854): WETLAND SOILS AND MITIGATION
Wetland soils as components of natural landscapes: biogeochemistry, hydrology, geomorphology, hydric soil indicators, and classification. Soil and hydrolic factors important to wetland delineation and jurisdictional determination. Mitigation of wetland impacts with emphasis on restoration and

creation. Constructed wetlands for water treatment. Odd years. I Pre: 3114 or 3134 or 3304. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Dairy Science

www.dasc.vt.edu/

R. M. Akers, Head and Horace E. and Elizabeth Alpin Professor
David R. and Margaret Lincicome Professor: F. C. Gwazdauskas
Professors: M. A. Barnes; B. G. Cassell; R. E. James; M. L. McGilliard; R. E. Pearson; C. C. Stallings
Associate Professors: M. D. Hanigan; K. F. Knowlton.
Assistant Professors: B. A. Corl; I. K. Mullarky; C. S. Petersson-Wolfe
Lecturer: D.R. Winston
Career Advisor: M. A. Barnes
Professor Emeritus: J. H. Herbein; R. L. Nebel; G. M. Jones; C. E. Polan; R. G. Saacke; J. M. White

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Overview

The purpose of the dairy science program is to offer students the opportunity to prepare themselves for a wide variety of careers by developing both their technical and interpersonal skills. Key factors in achieving this purpose are a challenging yet flexible curriculum that can be individualized to meet the educational needs and interests of each student, counseling to assist each student in designing individual programs, and extracurricular activities to enhance development of interpersonal skills.

Students may select from three curricula: production business management; science/biotechnology/pre-veterinary; and dual major. All options provide students with the opportunity to acquire a broad education in the sciences, social sciences, economics, mathematics, and communications while learning the basic principles of dairy enterprise management.

Dairy Enterprise Management Option

This is the most flexible curriculum, with at least 30 credits of electives. Suited to students with an interest in various fields of dairy production (herd manager, farm manager), allied agri-business industries (feed, artificial insemination, equipment), agricultural communications, public relations, extension, breed fieldperson, and a variety of other positions. Graduates in this option have also gone on to careers in college instruction, elementary school instruction, bank investment management, feed sales, and milk marketing, to name a few.

Biotechnology/Pre-Vet Option

This option is recommended for students who plan to continue into veterinary college or other graduate or professional schools, or who plan a career in quality control, laboratory work, or research and product development. It provides an excellent base in chemistry, mathematics, physics, biology and biochemistry for advanced study in many areas.

Dual Emphasis Option

This option is recommended for students who plan to concentrate in more than one academic area as they prepare for future careers. A few of the popular minors and double majors that students may earn while completing their Dairy Science degree requirements include: Agricultural Economics, Animal and Poultry Sciences, Biology, Computer Sciences, and Crop and Soil Environmental Sciences, etc.

Opportunities to Excel

Dairy science students may elect to dual major or minor in animal science, agricultural economics, or any of many other departments. Students are also encouraged to actively participate in extracurricular clubs and judging teams.

Active participation in research projects in lactation, genetics, nutrition, reproduction, and management provide qualified students valuable research experience with departmental scientists as well as part-time employment opportunities. These opportunities are available to students in all options and enhance their preparation for advanced study and provide a better understanding of the research process.

The dairy science honors program offers outstanding students the opportunity to enrich and broaden their academic programs. Honors students work closely with individual faculty members in choosing honors classes, colloquia, independent study, and research projects. Graduation "in honors" requires successful completion of university honors requirements, a comprehensive oral examination, and an honors thesis.

Graduate programs of study leading to the M.S. and Ph.D. also are offered (see Graduate Catalog).

Course Requirements

All curricula for the various options contain a core of courses to assist students in developing knowledge and ability in natural sciences (biology and chemistry), computational skills (math and computer science), writing and communication (English, communications, and seminars), as well as animal physiology and production, nutrition and genetics, farm finance, food science and dairy sciences. A list of courses specified for each option may be obtained upon request from the department. In the following listing, semester hour credits are shown at the right.

Dairy Science Major	***credits***
DASC 2474/Dairy Science & Industry	2
DASC 2484/Dairy Cattle Evaluation	*3
DASC 3274/Applied Dairy Nutrition	*3
DASC 3474/Dairy Information Systems	3
DASC 4475-4476/Dairy Enterprise Mgt.	*6
DASC 4174/Applied Dairy Genetics	*3
DASC 4304/Applied Reproduction	*2
DASC 4074/Professional Development	3
DASC 4374/Physiology of Lactation	3
ALS 2304/Animal Phys. & Anatomy	4
ALS 3104/Animal Genetics	3
ALS 3204/Animal Nutrition	3
ALS 3304/Phys. of Reproduction	3
Total:	**41**

* Must complete two of these for the Biotechnology/Pre-vet Option.

Math & Natural Sciences	
Chemistry	6-8
Mathematics & Statistics	6
Biology	8
Microbiology	4
Total Credits:	**24-26**
Social Sciences & Humanities	
Agric. Econ. or Economics	6
English	6
Humanities, Global, Aesthetics	10
Total Credits:	**22**
Elective credits (minimum):	**28-30**

Total credits for graduation:	**120**

Requirements for Minor in Dairy Science

Requirements include DASC 2474 (2 cr.), DASC 3474 (3 cr.), DASC 4374 (3 cr.), and DASC 4475 **or** DASC 4476 (3 cr.). Nine additional credits in DASC electives are also required.

Satisfactory Progress

After completion of 72 semester credits (including transfer, advanced placement, advanced standing and credit by examination, "satisfactory progress" will include the following:

- completion of 24 semester credit in any area of the Curriculum for Liberal Education
- completion of 9 semester credits in required in-major courses

Undergraduate Course Descriptions (ALS)

1004: AGRICULTURE, THE ARTS AND SOCIETY
Introduction to the relationships among agriculture, society, and the arts, all of which are integral components of civilization. Pass/Fail only. (1H,1C) I, II.

1504: INTRODUCTION TO AGRICULTURE AND LIFE SCIENCES
Concepts and issues important for early orientation of all students considering a career in agriculture and life sciences, and a review of state, national, and international agricultural issues will be covered in relation to majors in the College. I (1H,1C)

1514: MICROCOMPUTERS IN AGRICULTURE
Microcomputer course designed primarily for agriculture students. Emphasis is put on learning the basic skills needed to solve agricultural problems with a microcomputer. Topics include: hardware, electronic spreadsheets, word processors, data base management systems, computer graphics, and communications. (1H,3L,2C) I,II.

2304: COMPARATIVE ANIMAL PHYSIOLOGY AND ANATOMY
Comparative anatomy and physiology of domestic mammals and birds including cell neural, musculoskeletal, respiratory, cardiovascular, urinary, and endocrine systems. Pre: BIOL 1106. (3H,2L,4C) I,II.

2404 (BIOL 2404): BIOTECHNOLOGY IN A GLOBAL SOCIETY
Introduction to the world-wide impact of biotechnology and molecular biology, including applications to plants, animals, and microorganisms. Explores basic concepts of genetic engineering, scientific and ethical issues, and public concerns related to biotechnology. Topics include: environmental release of genetically engineering organisms, bioremediation, safety of genetically engineered food products, transgenic plants and animals, gene therapy, and genetic screening. Pre: (BIOL 1015, BIOL 1016) or (BIOL 1105, BIOL 1106) or (BIOL 1205H, BIOL 1206H), (CHEM 1015, CHEM 1016). (3H,3C) II.

2504: ANIMALS IN SOCIETY
Overview of animal well-being and behavior, human-animal interactions, responsibilities to animals, animal care, behavior, disease and pain recognition and current topics concerning companion animals, domestic animals and wildlife. (2H,3L,3C) II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: ANIMAL BREEDING AND GENETICS
Principles of genetics related to improvement of domestic farm animals. Molecular, cellular and physiological genetics, estimation of breeding values, selection, heritabilities, genetic correlations, relationships, in-breeding, heterosis, genetic abnormalities. I Pre: BIOL 1105, STAT 2004. (2H,2L,3C)

3134: LIVESTOCK AND THE ENVIRONMENT
Environmental issues associated with animal agriculture. Nutrient contamination of water resources, odor emission from livestock farms, environmental regulations affecting animal agriculture, and management practices to reduce the impacts of livestock farms on air and water quality. II. Pre: BIOL 1005, BIOL 1006 or BIOL 1105, BIOL 1106. (3H,3C)

3204: ANIMAL NUTRITION AND FEEDING
Characteristics, sources, digestion, absorption, and metabolism of water, carbohydrates, lipids, proteins, vitamins, and minerals. Feeding systems for livestock, poultry and companion animals. Pre: 2304, (CHEM 1036 or CHEM 1036H or CHEM 1016). (3H,3C) I,II.

3304: PHYSIOLOGY OF REPRODUCTION
Physiological mechanisms that control and affect reproductive processes in domestic mammals, birds and other selected species. Pre: 2304. (2H,3L,3C)

3954: STUDY ABROAD
Variable credit course.

4404 (GEOG 4404) (NR 4404) (UAP 4404): APPROACHES TO INTERNATIONAL DEVELOPMENT
An introduction to issues relating to international development. The course will focus on areas to help students better understand the interdependencies between countries and how institutions and organizations can foster effective working relationships on global projects of mutual interest between countries. (1H,1C) I.

4504: NATURAL RESOURCE CONSERVATION
Designed primarily to train elementary and secondary teachers, supervisors, and administrators in natural resource conservation. A three-week course. Emphasis is placed on soils, water, geology, forestry, wildlife, and marine life. Available for graduate credit except to agronomy, forestry, and wildlife majors. (3H,3L,4C) III.

4524: FARMING SYSTEMS RESEARCH AND DEVELOPMENT
Characteristics of extensive and intensive farming systems in developing countries. Comparison with U.S. small farming systems. Methods of multi-disciplinary team organization, informal team surveys, grouping farm households, and design and analysis of on-farm trials. Introduction of these methods into developing country and domestic research and extension systems. I (3H,3C)

4554 (BIOL 4554): NEUROCHEMICAL REGULATION
Neurochemical transmission within the vertebrate brain will be examined. Emphasis will be placed on the chemical coding underlying the control of various behaviors and how these systems can be modified by various drugs or diet. Pre: (2304 or BIOL 3404), CHEM 2535. (3H,3C) II.

4574 (BIOL 4574): SOCIAL BEHAVIOR OF BIRDS AND MAMMALS
This course examines origins, influences and implications of social behavior in a variety of avian and mammalian species. Emphasis is placed on understanding group organization and dynamics in inter and intra-species situations. Experimental data from several disciplines (e.g., genetics, physiology, biochemistry) are reviewed to demonstrate their associations with behavioral adaptive mechanisms. Avian and mammalian species living in wild, zoo, agricultural, companion and laboratory settings are discussed. Pre: 3104 or BIOL 2004, BIOL 1106. (3H,3C)

4614 (NR 4614): WATERSHED ASSESSMENT, MANAGEMENT, AND POLICY
Multidisciplinary perspectives of assessment, management and policy issues for protecting and improving watershed ecosystems. Topics include: monitoring and modeling approaches for assessment, risk-based watershed assessment geographic information systems for watershed analysis, decision support systems and computerized decision tools for watershed management, policy alternatives for watershed protection, urban watersheds, and current issues in watershed management. Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FOR, GEOL, LAR, CSES, ENT, BIO, GEOG, AAEC, UAP or equivalent. (2H, 2C). II. (2H,2C)

4964: FIELD STUDY/PRACTICUM
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Undergraduate Course Descriptions (DASC)

1574: INTRODUCTION TO DAIRY SCIENCE
The scope of the dairy science undergraduate program is presented. Preparation for careers in dairy production and related industries. May be taken only by new freshmen and transfer students. I (1H,1C)

2474: DAIRY SCIENCE AND INDUSTRY
Science, technology, and business associated with production, processing, and marketing of milk and milk products. Biology of dairy cattle with emphasis on genetics, reproduction, lactation, and nutrition. Management of dairy herds.
(2H,2C) II.

2484: DAIRY CATTLE EVALUATION
Critical appraisal of dairy cattle conformation and experience in linear trait scoring, linear trait relationships to profitability, competitive judging; written and oral justification; organization and conduct of shows and contests; showmanship. (6L,2C) II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3274: APPLIED DAIRY CATTLE NUTRITION
Application of basic principles of nutrition in developing rations for dairy herds. Emphasis is placed on appropriate use of forages, ration formulation techniques, development of profitable rations, and ration delivery. I (3H,3C)

3474: DAIRY INFORMATION SYSTEMS
Development, function, and use of dairy information systems including computerized performance testing programs for dairy cattle improvement and dairy herd management. (3H,3C)

4074: PROFESSIONAL DEVELOPMENT
This is a capstone course addressing issues of importance in the dairy industry and society in general. The course will emphasize the use of writing to promote critical thinking, evaluation and problem solving, and developing and presenting persuasive arguments. Instruction will be provided on selecting, securing, and succeeding in careers (career choices, resumes, application letters, interviewing, etc.) (3H,3C) I.

4174: APPLIED DAIRY CATTLE GENETICS
Application of genetic principles to dairy cattle improvement. Setting goals for genetic improvement, characteristics of traits included in selection, current methods of estimating breeding values, the role of artificial insemination and breed associations in genetic improvement, cattle genetics. (2H,3L,3C) II.

4304: PRINCIPLES & PRACTICES OF BOVINE REPRODUCTION
Principles and techniques in reproductive physiology and herd management related to health, record keeping, estrus detection and synchronization, and ultrasonography. Ovarian function and superovulation, semen handling, artificial insemination and pregnancy detection are also considered. (1H,3L,2C) I.

4374: PHYSIOLOGY OF LACTATION
Anatomy of the mammary gland and physiology of lactation in domestic and laboratory mammals with emphasis on dairy cattle. Mammary gland health and factors affecting lactation. Principles and techniques in dairy herd milking management. Pre: ALS 2304. (2H,3L,3C) II.

4384: MAMMARY IMMUNOLOGY
This course is designed to provide students with basic knowledge of immunology as related to diseases of the mammary gland. Concepts of mammary gland immunity, disease etiology, immunopathology, diagnosis and therapy will be covered with a focus on ungulate species. Host pathogen interactions, solving problems, writing intensive, literature search. Pre: ALS 2304, ENGL 1106. (3H,3C)

4475-4476: DAIRY ENTERPRISE MANAGEMENT
Decision strategies for modern dairy businesses. 4475: Emphasis on relationships of enterprises and techniques for evaluation of business alternatives, efficiency of production, and profit. Use of microcomputer software to support management decisions. 4476: Concentration on herd replacements, personnel, facilities and issues of management associated with rapidly changing national and international markets, environmental regulations, and computer applications. Group projects and hands-on management of university dairy herd. Pre: 2474 or AAEC 3404 for 4475; 4475 for 4476. 4475: (3H,3C) 4476: (2H,3L,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Entomology

http://www.ento.vt.edu

Loke T. Kok, Head
Professors: J. R. Bloomquist; R. D. Fell; D. A. Herbert, Jr.; L. T. Kok; D.E. Mullins; D. G. Pfeiffer; S. M. Salom; P. B. Schultz; P. J. Semtner; J. R. Voshell, Jr.; R. R. Youngman; M. J. Weaver
Associate Professors: J.C. Bergh; C. C. Brewster; T. P. Kuhar; D. M. Miller; S. L. Paulson
Assistant Professors: Z. N. Adelman; K. M. Myles; I. V. Sharakhov

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Overview

Entomology is both a basic and an applied science which deals with the study of insects and their effects upon the health, economy, and welfare of humankind.

The department offers graduate programs leading to the M.S.L.F.S. (thesis or non-thesis) and Ph.D. (see Graduate Catalog). The departmental teaching, research, and extension programs are closely coordinated with those of other departments.

Insects are important as agricultural, health, and aesthetic pests and as beneficial organisms which serve as pollinators, biological control agents for pest populations, and as components of natural ecosystems. While entomologists have only scratched the surface in the study of insects and related arthropods, their research has yielded great benefits to humankind. Examples include reductions in human diseases transmitted by insects and the leadership shown by entomologists in the development of integrated pest management principles and procedures.

Undergraduate Course Descriptions (ENT)

2004: INSECTS AND HUMAN SOCIETY
An appreciation of the past, present and future role of insects with human society. Includes how to identify common insects and other arthropods, the effects of insects on human history; diseases transmitted by insects and their worldwide impact; insects and their influence on our language, literature, and the arts; management of pests of plants, animals, and its effects on environmental pollution; and practical information of how to recognize and manage important insects and arthropods, such as termites in houses
and fleas on animals. (3H,3C) I,II,III,IV.

2254: BEES AND BEEKEEPING
An introduction to honey bee biology, the social organization of the honey bee colony and to modern apiculture, including the use of bees for pollination. Topics on beekeeping include equipment, how to get started, and colony management practices. (2H,2C) II.

2264: BEES AND BEEKEEPING LABORATORY
A laboratory course which examines the principles and practices of modern apiculture as they relate to honey bee biology. An emphasis is placed on students gaining practical field experience in modern management techniques. Co: 2254. (3L,1C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014 (BIOL 3014): INSECT BIOLOGY
Insect biology provides an introduction to the science of entomology. The course covers the diversity of insects, their biology and behavior, the importance of insects and insect control programs in agriculture, and the effects that insects have had on human history and culture. Laboratory (3024) is optional. I Pre: (BIOL 1005, BIOL 1006) or (BIOL 1105, BIOL 1106) or (BIOL 1205H, BIOL 1206H). (2H,2C)

3024 (BIOL 3024): INSECT BIOLOGY LABORATORY
Taxonomy and ecology of insects commonly encountered. Identification of all orders and many common families. Ecological attributes of each taxon, including food, habitat, life cycle, and behavior. An insect collection is required. I Pre: (BIOL 1005, BIOL 1006) or (BIOL 1105, BIOL 1106) or (BIOL 1205H, BIOL 1206H). Co: 3014. (3L,1C)

3254 (BIOL 3254): MEDICAL AND VETERINARY ENTOMOLOGY
An introduction to the roles of insects and other arthropods in the direct causation of disease in humans and animals, and as vectors in the transmission of disease organisms. The epidemiology and replication cycles of vector-borne pathogens with major medical and veterinary importance will be examined. Information will be provided on the biology and behavior of disease vectors and external parasites, and on the annoying and venomous pests of humans and animals. Mechanisms of control will be discussed Pre: (BIOL 1005, BIOL 1006) or (BIOL 1105, BIOL 1106) or (BIOL 1205H, BIOL 1206H). (3H,3C) II.

3264 (BIOL 3264): MEDICAL AND VETERINARY ENTOMOLOGY LABORATORY
Taxonomy and anatomy of insects and arthropods of medical and veterinary importance. Examination of feeding behavior and ecology. Emphasis on the mechanism of injury or pathogen transmission by each group. II. Pre: (BIOL 1105, BIOL 1106) or (BIOL 1005, BIOL 1006) or (BIOL 1205H, BIOL 1206H). Co: 3254. (3L,1C)

4254: INSECT PEST MANAGEMENT
Principles of insect pest management with application to the major insect pests found in Virginia. Pest management involves the utilization of all effective control practices in a program which is ecologically and economically efficient. This course is intended for all students with an interest in efficient agricultural production and in reducing losses to our most diverse competitor.
One year of General Biology required. (2H,3L,3C) II.

4264 (PPWS 4264): PESTICIDE USAGE
An interdisciplinary study of pesticides used in urban and agricultural environments. Topics studied will include: classification, toxicology, formulation, application techniques, safety, legal considerations, environmental impact, and research and development of new pesticides. Pre: CHEM 2515 or CHEM 2536. (2H,3L,3C) II.

4354 (BIOL 4354): AQUATIC ENTOMOLOGY
Biology and taxonomy of insects and other macroinvertebrates most commonly encountered in freshwater environments. Selected aspects of biology, such as habitat, feeding, locomotion, and life history. Identification of individual taxa, mostly at family and genus level. Significance of these organism in aquatic ecology, pollution monitoring, and natural resource management. Pre: (BIOL 1005, BIOL 1006), (BIOL 1015, BIOL 1016) or (BIOL 1105, BIOL 1106, BIOL 1115, BIOL 1116). (3H,3L,4C)

4484 (BIOL 4484) (FIW 4484): FRESHWATER BIOMONITORING
Concepts and practices of using macroinvertebrates and fish to monitor the environmental health of freshwater ecosystems. Effects of different types of pollution and environmental stress on assemblages of organisms and underlying ecological principles. Role of biological studies in environmental regulation. Study design, field and laboratory methods, data analysis and interpretation, verbal and written presentation of results. Pre: (BIOL 2804), (BIOL 4004 or BIOL 4354 or ENT 4354 or FIW 4424 or FIW 4614). (3H,3L,4C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Environmental Science

http://www.ensc.vt.edu/

James R. McKenna, Chair
Program Advisory Committee: J. R. McKenna (chair); W. L. Daniels; T. A. Dillaha; D. L. Gallagher; G. L. Long; D. J. Parrish; J. Randolph; J. R. Voshell; J. R. Webster
Coordinating Counselors and Career Advisors:
M. J. Eick (231-8943; eick@vt.edu); D. J. Parrish (231-9778; dparrish@vt.edu)

Overview

This program brings the basic sciences to bear on many crucial concerns about the environment. The environmental matters of particular interest revolve around ecosystems and our land and water resources. Specific concerns include ecosystem services, environmental protection, land-use planning, waste management, ground- and surface-water quality, reclamation and remediation of disturbed or contaminated sites, and minimizing agricultural and other human impacts on the environment.

The environmental science curriculum is multidisciplinary and strongly science and technology oriented. The basic sciences and computational skills are at the core of each of the major's four options, but specific requirements make each option unique. The curriculum prepares one for immediate entry into environmental careers, as well as for graduate specializations. The environmental job market is quite strong, with a shortage of qualified individuals in the field.

The four concentrations, or curricular options, within the major and some of the career opportunities associated with each are as follows:

Aquatic Resources Option

The emphasis in this option is on fresh water. Both surface- and ground-water quality become degraded as a result of human activities. Those processes, their consequences, and solutions are the focus of this option. Students in this option are entering careers in the areas of regulation, remediation, and environmental protection.

Land Resources Option

This option develops an understanding of many of the complex biological, chemical, economic, geological, and soil factors that must enter into good decisions on land use. The graduates in this option find employment with various governmental agencies and in the private sector.

Plant Resources Option

Plants are used in a variety of ways to solve environmental problems. Reclamation of disturbed areas often involves establishing vegetation. Plants are important components of wetlands, which provide a number of important environmental functions. Plants may also be used to remove pollutants from the soil or water. This option provides a track for students seeking environmental careers that build on their interest in plants.

Waste Management Option

Our "throw-away society" has begun to feel many of the consequences of that ethic. This option deals not only with environmental cleanup

and safe disposal but also with waste minimization, recycling, and other alternatives. Graduates find opportunities in regulatory agencies as well as in the private sector. The reclamation industry is a major employer, as are manufacturers and municipalities that must comply with waste management laws.

Requirements for a Major

Students must complete all of the core requirements listed below plus the additional requirements for at least one of the four options.

Math, Technology, and Natural Sciences Core	
BIOL 1105,1106,1115,1116: Principles of Biology, Lab	8
CEE 3104: Intro to Environmental Engineering	3
CHEM 1035, 1036, 1045, 1046: General Chemistry, Lab	8
CHEM 3114, 3124: Analytical Chem. for Life Sciences, Lab	4
CHEM 2535, 2545: Organic Chemistry, Lab	4
CSES 1004: Introduction to Crop and Soil Environmental Sciences	1
CSES/ENSC 3114, 3124: Soils, Lab	4
ENSC 3604: Fundamentals of Environmental Science	3
ENSC 3634: Physics of Pollution	3
ENSC 4004: Senior Seminar	1
GEOS 4804: Groundwater Hydrology	3
MATH 1016,2015,2016: Elementary Calculus with Trig. I/II	9
PHYS 2205: General Physics	3
STAT 3615: Biological Statistics	3
Humanities, Writing, and Social Sciences Core	
AAEC 1005,1006: Economics of Food & Fiber System	6
ENGL 1105,1106: Freshman English	6
ENGL 3764: Technical Writing	3
Creativity and Aesthetic Experience (Liberal Education Area 6)	1/3
Ideas, Cultural Traditions, and Values (Liberal Education Area 2)	6
Additional Requirements for the Aquatic Resources Option	
BIOL 2604, 2614: General Microbiology, Lab	4
BIOL 2804: Ecology	3
BIOL 4004: Freshwater Ecology	4
BIOL/CEE/CSES/ENSC 4164; Environmental Microbiology	3
CSES 4594: Soil/Groundwater Pollution	3
Technical Electives (40+ courses from which to choose)	18
Additional Requirements for the Land Resources Option	
CSES 4124: Soil Survey and Taxonomy	3
CSES/CEE 4594: Soil and Groundwater Pollution	3
CSES 4734: Environmental Soil Chemistry	3
CSES/ENSC/GEOG 4844: Soil Interpretation Using GIS and DSS	3
GEOG 4084: Introduction to GIS	3
GEOS 1004, 1104: Physical Geology, Lab	4
UAP 4374: Land Use & Environment: Planning & Policy	3
Technical Electives (40+ courses from which to choose)	13
Additional Requirements for the Plant Resources Option	
BIOL 2304: Plant Biology	3
BIOL 2604, 2614: General Microbiology, Lab	4
BIOL 2804, 3114: Ecology, Lab	4

BIOL 3204: Plant Taxonomy	3
ENSC 3644: Plant Materials for Environmental Restoration	3
PPWS 3505,3506,3514: Plant Physiology & Environment	7
Technical Electives (40+ courses from which to choose)	11
Additional Requirements for the Waste Management Option	
BIOL 2604,2614: General Microbiology, Lab	4
BIOL/CEE/CSES/ENSC 4164: Environmental Microbiology	3
CEE 4174: Solid & Hazardous Waste Management	3
CEE/CSES 4594: Soil/Groundwater Pollution	3
CSES/ENSC 4734: Environmental Soil Chemistry	3
GEOS 1004, 1104: Physical Geology, Lab	3
Technical Electives (40+ courses from which to choose)	15
Total credits (all options)	**120**

Requirements for a Minor

The environmental science program also offers a minor. The requirements include CSES/ENSC 3114 plus 3124 (or CSES/ENSC 3134) and ENSC 3604 and 14 to 15 more hours selected from a set of 23 courses. See 240 Smyth Hall or www.ensc.vt.edu for more information about a minor in environmental science.

Satisfactory Progress

By the end of the academic year in which a student has attempted 60 hours, "satisfactory progress" will include:

1. declaring an option within ENSC
2. passing the following:

BIOL 1105, 1106, 1115, 1116
12 hours of CHEM
ENSC 3604
CSES/ENSC 3114 and 3124
9 hours of MATH and/or STAT

Opportunities to Excel

Students with outstanding records can qualify for the Honors Program and graduate "in honors" in environmental science. Other opportunities for personal and professional growth and for recognition include the department-sponsored Environmental Student Organization, membership in Alpha Zeta and other honoraries, and several scholarships designated for majors. Faculty members work with undergraduates on a variety of environmental research projects. Many employers seek environmental science majors for internship and co-op positions.

Undergraduate Course Descriptions (ENSC)

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114 (CSES 3114) (GEOS 3614): SOILS
Characterization of soils as a natural resource emphasizing their physical, chemical, mineralogical, and biological properties in relation to nutrient availability, fertilization, plant growth, land-use management, waste application, soil and water quality, and food production. For CSES, ENSC, and related plant- and earth-science majors. Partially duplicates 3134. Junior standing. Pre: CHEM 1036. Co: 3124. (3H,3C) I.

3124 (CSES 3124) (GEOS 3624): SOILS LABORATORY
Parent materials, morphology, physical, chemical, and biological properties of soils and related soil management and land use practices will be

studied in field and lab. Partially duplicates 3134. Co: 3114. (3L,1C) I.

3134 (CSES 3134): SOILS IN THE LANDSCAPE
A study of soils as functional landscape components, emphasizing their physical, chemical, mineralogical, and biological properties in relation to plant growth, nutrient availability, land-use management, and soil and water quality. Primarily for FOR/FIW, LAR, and other plant/earth science related majors. May not be taken by CSES or ENSC majors. Partially duplicates 3114 and 3124. Pre: one year of introductory CHEM or BIOL or GEOS. (2H,3L,3C) II.

3604: FUNDAMENTALS OF ENVIRONMENTAL SCIENCE
Interrelationships between human activities and the environment; provides national and global perspective; emphasis is on the physical, chemical, and biological principles and processes that are essential to an understanding of human-environment interactions; the role of energy in human and natural systems; environmental legislation and human behavior. I Pre: BIOL 1105 or CHEM 1035. (3H,3C)

3634 (CSES 3634): PHYSICS OF POLLUTION
Physical processes that control the fate of pollutants in our land, air, and water resources. Types and sources of pollutants, physical processes in the soil-water-atmosphere continuum controlling the dispersion and deposition of pollutants, the movement of pollutants, including radionuclides, by surface and subsurface water flow in soils, and physics of disturbed soils. I Pre: (CSES 3114, PHYS 2206, MATH 2016). (3H,3C)

3644 (CSES 3644): PLANT MATERIALS FOR ENVIRONMENTAL RESTORATION
Overview of ecological principles related to revegetation and restoration of disturbed sites. Function and species requirements of plants in stabilizing disturbed areas including mines, rights-of-way, constructed wetlands, and for the remediation of contaminated soils. I Pre: BIOL 1106. Co: CSES 3114. (3H,3C)

4004: SENIOR SEMINAR
Professional ethics within environmental science; critical consideration of topics of current interest in environmental science. Senior standing required. Restricted to ENSC majors. I (1H,1C)

4114 (CSES 4114): SOIL PHYSICS
Application of the principles of physics and mathematical analysis to the study of soils. Covers the physical nature and properties of soil solids, basic soil mechanics, physical state of water in soils, infiltration and movement of water in soils, mass transport in soil solutions, soil gases and soil aeration, heat and heat transfer in soils. I Pre: CSES 3114, PHYS 2205, MATH 2015. (3H,3L,4C)

4164 (BIOL 4164) (CEE 4164) (CSES 4164): ENVIRONMENTAL MICROBIOLOGY
Ecology, physiology, and diversity of soil and aquatic microorganisms; incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Pre: BIOL 2604. (2H,3L,3C) II.

4734 (CHEM 4734) (CSES 4734): ENVIRONMENTAL SOIL CHEMISTRY
Chemistry of inorganic and organic soil components with emphasis on environmental significance of soil solution-solid phase equilibria, sorption phenomena, ion exchange processes, reaction kinetics, redox reactions, and acidity and salinity processes. I Pre: CSES 3114, CSES 3124, CHEM 2514 or CHEM 2535, CHEM 3114, MATH 2015. (3H,3C)

4754 (CHEM 4754) (CSES 4754): INSTRUMENTAL ANALYSIS FOR AGRICULTURAL AND ENVIRONMENTAL SCIENCES
Theory and principles of common analytical instruments and their applications to agriculture and environmental science research. Topics include atomic absorption and emission spectroscopy, spectrophotometric methods (UV, visible, luminescence, and automation), chromatography, ion-selective electrodes, and microwave digestion. Infrared spectroscopy, atomic ratio and molecular mass spectroscopy, nuclear magnetic resonance will also be included. Provides hands-on experience with modern analytical instruments. Prerequisites or graduate standing required. Pre: (CHEM 3114, CHEM 3124) or (CSES 3114, CSES 3124). (3H,3L,4C) II.

4774 (CSES 4774): RECLAMATION OF DRASTICALLY DISTURBED LANDS
Remediation, rehabilitation, revegetation strategies for lands disturbed by mining, construction, industrialization, and mineral waste disposal. Disturbed site characterization and materials analysis procedures. Regulatory and environmental monitoring frameworks for mining sites and other disturbed lands. Prediction and remediation of water quality impacts from acid drainage. Pre: CSES 3114 or ENSC 3114 or GEOS 3614 or CSES 3134 or ENSC 3134 or CSES 3304 or GEOG 3304 or GEOS 3304.(3H,3C)

4854 (CSES 4854): WETLAND SOILS AND MITIGATION
Wetland soils as components of natural landscapes: biogeochemistry, hydrology, geomorphology, hydric soil indicators, and classification. Soil and hydrolic factors important to wetland delineation and jurisdictional determination. Mitigation of wetland impacts with emphasis on restoration and creation. Constructed wetlands for water treatment. Odd years. I Pre: 3114 or 3134 or CSES 3304. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study

Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Agriculture and Life Sciences

Food Science and Technology

www.fst.vt.edu
E-mail: fstinfo@vt.edu

J.E. Marcy, Head
Distinguished Professor: G.J. Flick, Jr.
Professors: S.E. Duncan; M.L. Jahncke; J.E. Marcy; S.F. O'Keefe; S.S. Sumner; B.W. Zoecklein
Associate Professors: J.D. Eifert; W.N. Eigel; R.C. Williams
Assistant Professors: R.R. Boyer; M.A. Ponder; K. Zhou
Professor Emeritus: N.G. Marriott; M.D. Pierson
Associate Professor Emeritus: P.P. Graham
Adjunct Faculty: B. Blakistone; R.E. Croonenberghs; C.R. Hackney
Career Advisor: W.N. Eigel

Overview

Food science benefits consumers every day with healthier diets, better tasting affordable foods, and increased food safety. In the Department of Food Science and Technology, you really do get to play with your food! Food Science is an exciting area that applies a blend of basic sciences such as biology, chemistry and physics with microbiology, biochemistry, mathematics and engineering to improve the taste, nutrition and value of the world's food supply. The Food Science and Technology curriculum includes hands-on experiences that supports classroom instruction with practical applications and creative opportunities for product development.

Demand for Food Science and Technology graduates has never been greater. Practically 100% of Virginia Tech Food Science and Technology graduates have jobs in product development, research, sales and marketing, quality assurance, production management, analytical and technical services and regulatory affairs at graduation. Food processing is the largest industry in the United States. This industry employs nearly 2 million people and accounts for more than 16 percent of the country's gross national product. Our B.S. graduates enjoy an average starting salary of $40,000-$45,000. In a recent survey of U.S. Food Science programs, Virginia Tech ranked 6th nationally in placing Food Science B.S. graduates into graduate or professional schools.

The Virginia Tech Department of Food Science and Technology is the only food science department in Virginia. The program is recognized by the national Institute of Food Technologists (IFT) as having curricula and options that meet the "IFT Undergraduate Education Standards for Degrees in Food Science." Students enrolled in these programs are eligible to apply for IFT Scholarships. The Virginia Tech Food Science Club is a student chapter of the national IFT organization and one of several departmental clubs that permits students to meet professionals in the food industry, develop leadership skills and enhance their educational experience. Students have excellent opportunities for internships as an additional way to explore different facets of the food industry.

Our building is home to a 5,000 square-foot processing area, a pilot-scale dairy processing area, a fully-equipped research winery, a cutting-edge high-pressure processing area as well as laboratories modernly equipped for chemical, physical and microbiological analysis. Our faculty and staff received over $3 million in sponsored research funding last year.

In the Department of Food Science and Technology you have the option to receive a Bachelor of Science in Food Safety and Microbiology, Food and Flavor Chemistry, Food Product and Package Development, or Food Economics and Marketing.

Food Safety and Microbiology
Discover why foods can spoil or cause illness. Help discover new ways to improve food safety and development fermentations for new beverages and food products.

Food and Flavor Chemistry
Learn how to make foods taste good and tempting to eat. Be trained as a sensory expert in food evaluation.

Food Product and Package Development

Gain knowledge to create foods that can improve health and packages that improve food quality and increase convenience.

Food Economics and Marketing
Develop skills to succeed in sales and marketing within the food processing industry. Learn how to ensure that food companies are meeting government, company, and industry standards.

In addition to the options we offer, the Department of Biology also has a food biology option. The Department also offers a minor (please consult a department representative for requirements), as well as a double-major option in Food Science and Technology to students in all other colleges of the university. Students completing the science option requirements will also be prepared for graduate and professional schools of medicine, dentistry and veterinary medicine. Food Science and Technology students have the opportunity to participate in stimulating undergraduate research projects and internships.

Science Option

First Year		**Second Year**	
Fall Semester	**(14)**	*Fall Semester*	**(16)**
BIOL 1005: Gen Biology	3	CHEM 2535: Org Chemistry	3
BIOL 1015: Gen Biol Lab	1	CHEM 2545: Org Chem Lab	1
CHEM 1035: Gen Chemistry	3	ECON 2005: Prin Economics	3
CHEM 1045: Gen Chem Lab	1	MATH 2015: Calculus/Trig II [1]	3
ENGL 1105: Fresh English	3	PHYS 2205: Gen Physics	3
MATH 1015: Calculus/Trig I [1]	3	Liberal Education Area 2[2]	3
Spring Semester	**(15)**	*Spring Semester*	**(16)**
Liberal Education Area 6	1	BIOL 2604: Gen Microbiol	3
BIOL 1006: Gen Biology	3	BIOL 2614: Gen Micro Lab	1
BIOL 1016: Gen Biol Lab	1	BCHM 2024: Biochem Conc	3
CHEM 1036: Gen Chemistry	3	CHEM 2536: Org Chemistry	3
CHEM 1046: Gen Chem Lab	1	ECON 2006: Prin Economics	3
ENGL 1106: Fresh English	3	Liberal Education Area 2[2]	3
MATH 1016: Calculus/Trig I [1]	3		
Third Year		**Fourth Year**	
Fall Semester	**(14)**	*Fall Semester*	**(15)**
FST 4405: Food Processing	4	COMM 2004: Public Speaking	3
FST 4504: Food Chemistry	3	HNFE 3025: Ntr Metabolism	3
FST 4534: Food CHEM Lab	1	STAT 3005: Biol. Statistics	3
Restricted Elective [2]	3	Restricted Elective [2]	3
Liberal Education Area 7	3	Free Elective	3
Spring Semester	**(15)**	*Spring Semester*	**(15)**
FST 3304: Unit Operations	4	FST 4514: Food Analysis	3
FST 4406: Food Processing	2	FST 4524: Food Qual Eval	3
FST 4604: Food Microbiol	4	STAT 3006: Biol. Statistics	3
Restricted Elective [2]	2	Restricted Elective [2]	3
Free Elective			

Notes:
[1] May substitute MATH 1205-1206 and reduce Restricted Elective Requirements to 11 hrs.
[2] Consult department for list of approved Restricted Electives and Curriculum for Liberal Education electives.

Technology Option

First Year		**Second Year**	
Fall Semester	**(14)**	*Fall Semester*	**(16)**
BIOL 1005: Gen Biology	3	ACIS 2115: Prin Accounting	3

BIOL 1015: Gen Biol Lab	1	BIOL 2604: Gen Microbiol	3
CHEM 1035: Gen Chemistry	3	BIOL 2614: Gen Micro Lab	1
CHEM 1045: Gen Chem Lab	1	CHEM 2514: Surv Org Chem	3
ENGL 1105: Fresh English	3	ECON 2005: Prin Economics	3
MATH 1525: Calculus/Matrices	3	Liberal Education Area 2 [2]	3
Spring Semester	**(15)**	*Spring Semester*	**(14)**
Liberal Education Area 6	1	ACIS 2116: Prin Accounting	3
BIOL 1006: Gen Biology	3	BCHM 2024: Biochem Conc	3
BIOL 1016: Gen BIOL Lab	1	ECON 2006: Prin Economics	3
CHEM 1036: Gen Chemistry	3	FST 2014: Intr Food Sci	2
CHEM 1046: Gen Chem Lab	1	Liberal Education Area 2	3
ENGL 1106: Fresh English	3		
MATH 1526: Calculus/Matrices	3		
Third Year		**Fourth Year**	
Fall Semester	**(16)**	*Fall Semester*	**(15)**
FST 4405: Food Processing	4	COMM 2004: Public Speaking	3
FST 4504: Food Chemistry	3	FIN 3104: Corp Finance	3
FST 4534: Food Chem Lab	1	BIT 3414: Prod Oper Mgmt	3
MGT 3304: Adm Theory Prac	3	Restricted Elective [2]	3
BIT 2405: Quant Methods	3	Free Elective	3
Restricted Elective [2]	2	*Spring Semester*	**(15)**
Spring Semester	**(15)**	FST 4514: Food Analysis	3
FST 4406: Food Processing	2	FST 4524: Food Qual Eval	3
FST 4604: Food Microbiol	4	MKTG 3104: Market Mgmt	3
BIT 2406: Quant Methods	3	Free Elective	6
Restricted Elective [2]	3		
Liberal Education Area 7	3		

Notes:
[1] May substitute any course on approved list for Area 6 of Curriculum for Liberal Education.
[2] Consult department for approved restricted electives and courses to fulfill Liberal Education area requirements.

Pre-Vet Option

First Year		**Second Year**	
Fall Semester	**(14)**	*Fall Semester*	**(17)**
BIOL 1105: Prin Biology [5]	3	CHEM 2535: Org Chemistry	3
BIOL 1115: Prin Biol Lab [5]	1	CHEM 2545: Org Chem Lab	1
CHEM 1035: Gen Chemistry	3	ECON 2005: Prin Economics	3
CHEM 1045: Gen Chem Lab	1	MATH 2015: Calculus/Trig II [1]	3
ENGL 1105: Fresh English	3	PHYS 2205: Gen Physics	3
MATH 1015: Calculus/Trig I [1]	3	PHYS 2215: Gen Phys Lab	1
Spring Semester	**(15)**	Liberal Education Area 2 [4]	3
Liberal Education Area 6	1	*Spring Semester*	**(14)**
BIOL 1106: Prin Biology [5]	3	CHEM 2536: Org Chemistry	3
BIOL 1116: Prin Biol Lab [5]	1	CHEM 2546: Org Chem Lab	1
CHEM 1036: Gen Chemistry	3	ECON 2006: Prin Economics	3

CHEM 1046: Gen Chem Lab	1	PHYS 2206: Gen Phys	3
ENGL 1106: Fresh English	3	Phys 2216: Gen Phys Lab	1
MATH 1016: Calculus/Trig I [1]	3	Liberal Education Area 2 [4]	3
Third Year		**Fourth Year**	
Fall Semester	**(14)**	*Fall Semester*	**(16 or 14)**
BIOL 2604: Gen Microbiol	3	Restricted Elective	3
BIOL 2614: Gen Micro Lab	1	COMM 2004: Public Speaking	3
FST 4405: Food Processing	4	FST 4504: Food Chemistry	3
STAT 3005: Biol. Statistics	3	FST 4534: Food CHEM Lab	1
Liberal Education Area 7	3	HNFE 3025: Nutr. Metabolism [3]	3
Spring Semester	**(16)**	Free Elective	3 (1)
BCHM 2024: Biochem. Conc.	3	*Spring Semester*	**(14)**
FST 4406: Food Processing	2	FST 4514: Food Analysis	3
FST 4604: Food Microbiol	4	FST 4524: Food Qual Eval	3
STAT 3006: Biol. Statistics	3	Restricted Electives	2
FST 3304: Unit Operations	4	Free Elective	6

Notes:
[1] May substitute MATH 1525-1526 or MATH 1205-1206.
[2] May substitute any course on approved list for Area 6 of Curriculum for Liberal Education.
[3] May substitute BCHM 4115-4116.
[4] Courses must be selected from approved list for Area 2 of Curriculum for Liberal Education.
[5] May substitute BIOL 1005-1006 and BIOL 1015-1016.

Satisfactory Progress

After having attempted 72 semester credits (including transfer, advanced placement, advanced standing and credit by examination and freshman rule hours), "satisfactory progress" will include:

- having passed at least 24 semester credits of Curriculum for Liberal Education requirements
- having passed 9 semester credits in the selected option

Undergraduate Course Descriptions (FST)

2014: INTRODUCTION TO FOOD SCIENCE
Fundamentals for food science and technology. Integration of basic principles of food safety, human nutrition, food spoilage, and sensory evaluation with the appropriate technology of food preservation and processing. (2H,2C) II.

2104: DAIRY PRODUCTS SENSORY EVALUATION
Study of sensory attributes of milk and dairy products important in evaluation and judging product quality. Consideration of production and processing methods affecting milk and dairy product quality as determined by organoleptic evaluation. Training in different sensory techniques for use in dairy products manufacturing and quality control. Consent required. I (3L,1C)

2544 (HUM 2544): FUNCTIONAL FOODS FOR HEALTH
Introduction to functional foods (foods with additional value beyond basic nutrition) including development of functional foods, novel sources, and traditional foods with value-added health benefit; regulatory issues; and media messages. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114 (HORT 3114): WINES AND VINES
Principles and standard practices of wine grape production, processing, and sensory evaluation for students with a professional interest in premium table wines. Junior standing and consent required. (2H,2L,3C) II.

3124: BREWING SCIENCE AND TECHNOLOGY

Study of chemical reactions important in brewing of beer and hard cider. Effects of variations in malting, mashing, and other processing steps on characteristics and quality of beer; fruit sugar, acid and fermentation impacts on cider composition and quality. Investigation of reactions that cause flavor deterioration. (3H,3C)

3214 (APSC 3214): MEAT SCIENCE
Fundamentals of meat science in meat inspection, carcass evaluation, fabrication, fresh meat, processed meat and product preservation on beef, pork, lamb, poultry, and seafood. Physical, chemical, physiological and microbiological properties of meat as related to composition and quality. Fundamentals in processing techniques, product quality assurance and food safety programs in meat industries. Pre: ALS 2304, BIOL 2604, CHEM 1015. (2H,4L,4C)

4014: FOOD PROD DEVELOPMENT
Application to the food industry of principles and standard practices of research and product development; functionality of food ingredients; students will work in teams to design and develop a new food product. I Pre: 4604. Co: 4504, 4405. (3H,3C)

4024: PRINCIPLES OF SENSORY EVAL
Principles of sensory evaluation including theory, sensory physiology and psychology, experimental methods, applications, and statistical analysis. (3H,3C)

4405,4406: FOOD PROCESSING
Basic principles, unit operations, and equipment involved in the commercially important food processing methods and unit operations; materials and containers used in food packaging; food laws, regulations, and standards. I Pre: BIOL 2604 for 4405; 3304 for 4406. 4405: (3H,3L,4C) 4406: (1H,3L,2C)

4504: FOOD CHEMISTRY
Consideration of the chemical constituents of foods with emphasis on their role in determining the nutritive value, functional properties, storage characteristics and acceptability of fresh and processed foods. I Pre: CHEM 2536, BCHM 2024. (3H,3C)

4514: FOOD ANALYSIS
Sampling techniques and theory and practice of chemical and physical methods of food analysis for determination of food composition; application of analytical methods to quality control and food law regulation problems. Pre: 4504. (2H,3L,3C) II.

4524: FOOD QUALITY ASSURANCE
Functions of quality control departments in monitoring safety and quality of food as well as compliance with government regulations. Description of federal regulatory agencies. Development of specifications, food standards and critical control points. Selection of analytical methods. Acceptance sampling and control charts. Microbiological quality control. Pre: 4405, 4604, STAT 3616. (3H,3C) II.

4534: FOOD CHEMISTRY LAB
Investigation of functional properties of proteins, carbohydrates, and lipids in processed foods including effect of environmental conditions; solubility, foaming ability and textural properties of proteins, carbohydrate crystallization, ability of polysaccharides to form gels and pastes, lipid absorption and tenderization, characterization of a natural-occurring enzyme. Co: 4504. (3L,1C)

4604 (BIOL 4604): FOOD MICROBIOLOGY
Role of microorganisms in foodborne illness and food quality, spoilage, and preservation. Control and destruction of microorganisms in foods. Pre: BIOL 2604, BIOL 2614. (3H,3L,4C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Horticulture

www.hort.vt.edu

J. Roger Harris, Head
Professors: B. L. Appleton; J. Latimer; R. Harris; J. Nowak; R. E. Veilleux; T. K. Wolf; G. E. Welbaum; R. D. Wright
Associate Professors: E. Beers; A. R. McDaniel; R. F. McDuffie; A. X. Niemiera; H. Scoggins
Assistant Professors: R. Conev; Freeman; J. Tokuhisa; R. Yuan; B. Zhao
Adjunct Professor: Y. Dan; P. Kitchin; C. Wang
Instructor: B. Kraft
AP Faculty Professional: D. Close; S. Huckestein
Research Associate: L. Fox
Career Advisors: A. R. McDaniel

Overview

Horticulture is a broad and diverse field involved with producing and utilizing a multitude of specialized plants. Benefits of this industry to all people are both physical and emotional. Horticulturists provide the fruits and vegetables so important to good nutrition. Horticulturists also improve the human environment, through both beautification and conservation, by providing the ornamental plants and designs utilized to enhance aesthetics within and around the home, workplace, and other areas. Thus, while the field is based on a biological and agricultural science foundation, there is ample opportunity for individuals also oriented toward business, social science, art, education, and international development.

The horticulture curriculum is fully individualized in consultation with a course advisor. Following the freshman year of core courses, students begin their personal programs of study in one of four options.

Landscape Contracting Option

This program encompasses all components of the landscape services industry, including both exterior and interior landscapes. Additional study in ornamental plants, turf, and business supplement development of a single or combined concentration in landscape design, installation, and/or maintenance. Students in this option enter careers as entrepreneurs or employees of turf and landscape businesses in these specialties, as well as garden center operations, arboreta and private gardens management, and as town or city horticulturists.

Horticulture Crops Option

This program focuses on managing the production and quality maintenance during marketing of the high value, intensively grown horticultural crops. Study of the specializations in growing fruit, vegetable, nursery, and floral crops is supplemented with business and other supporting courses for the student's emphasis area. Careers include commodity production and marketing, consulting and sales in horticultural supply firms, quality assurance, integrated pest management, and international development.

Horticulture Science Option

This program supplements the departmental core with additional science study, individualized horticultural and supporting course development, and a directed research experience. Students in this option are prepared for graduate study in horticulture and the related plant sciences or to enter the rapidly expanding technical fields in plant and crop improvement, including biotechnology.

Horticulture Education Option

This program develops a broad horticultural foundation with supplemental requirements for a wide array of careers in teaching horticulture. These may include teaching in the secondary schools (with agriculture or biology endorsement), extension (agricultural or youth programs), community colleges, and arboreta and botanical gardens. Continuation for a graduate degree may be desirable or required for some of these education careers.

Degree Requirements

Liberal Education (All Options)	**credits**
Area 1 - English	6
Area 2 - elected	6
Area 3 - Agricultural Economics/Economics	6
Area 4 - Biology/Chemistry	8
Additional Biology/Chemistry	6
Area 5 - Mathematics	6
Area 6 - elected	1
Area 7 - elected	3
Crop and Soil Environmental Science	4
Entomology	3
Horticulture Core	9
Plant Pathology, Physiology & Weed Science	7
Oral Communications	3
Option-Specific Additions to Core	
Agricultural Economics, other business	0-12
Biology	0-11
Chemistry	10
Crop and Soil Environmental Sciences	0-4
Horticulture	12-16
Plant Pathology, Physiology & Weed Science	3-4
Supporting Electives	11-31
Free Electives	6-12
Total Credits	**120**

Selection of the option may be delayed to the start of the junior year. Undecided (general horticulture) students may benefit in their course scheduling by a preliminary option selection supplemented with their alternative interest areas, e.g. landscape courses as electives to the Crops Option.

Students are required to gain work experience during their academic careers. This may be developed independently or coordinated through the department in the Cooperative Education Program or various internship programs with which the department maintains direct contact (current listings available under Internships at http://www.hort.vt.edu/). Other experience and enrichment programs available include the Honors Program for students with outstanding academic records, the Horticulture Club for all interested students and the honorary society Pi Alpha Xi, special industry field trips, and the opportunity to develop dual major and minor programs. A horticulture minor program is also available for students in other curricula.

The department offers programs leading to the M.S. and Ph.D. Areas of specialization include plant breeding and genetics, growth and development, physiology, molecular biology, intensification of production through modern cultural practices and innovative approaches, and urban horticulture.

Satisfactory Progress

By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing and credit by exam), "satisfactory progress" toward the degree will include the following minimum criteria:

- having a grade point average of 2.0

- passing at least 24 semester credits that apply to the Curriculum for Liberal Education
- passing the following:

BIOL 1105 and 1106
CHEM 1035 and 1036
HORT 2224, 2234 or 2244
6 credits additional HORT courses
6 credits from CSES 3114, ENT 4254 or 4524, PPWS 3104, 3505 or 3506

Undergraduate Course Descriptions (HORT)

2134: URBAN HORTICULTURE
Introduction to the important ways that urban and suburban citizens and consumers can tap the art, science, practice, and commercial products and services of Horticulture to enhance their own quality of life, and the quality of the regional environment in which they live. This course will address people-plant interactions at the scales of individuals, families, neighborhoods, communities and regions, teaching students the importance of addressing land use decisions at all these scales. (3H,3C)

2144: INDOOR PLANTS
Basic horticultural principles, identification and cultural criteria applicable to foliage and flowering plants grown indoors. Specific plant groups discussed include ferns, cacti and succulents, and carnivorous plants, among many others. Non-majors only. (3H,3C) I,II,III.

2154 (SPAN 2154): SPANISH FOR THE GREEN INDUSTRY
Dialogue-based language course focusing on the vocabulary and grammatical structures pertaining to Green and Agricultural Industry jobs. Includes vocabulary and context specific to jobs and workers in greenhouse, nursery, turf and landscape environments. Spanish culture is included throughout the course along with grammar and structure. Prior study in Spanish is helpful but not required. I, II. (3H,3C)

2164: FLORAL DESIGN
Principles and methods in floral art through designs for home and public environments. (2H,3L,3C) I,II.

2184: GLOBALIZATION AND HORTICULTURE
Globalization, the interaction and integration of people, companies, and governments, is driven by international trade and investments. This course provides students with the knowledge of horticultural crops (fruits, vegetables, ornamental plants) as a significant component of global trade. (3H,3C) II.

2224: HORTICULTURE SCIENCE AND INDUSTRY
Survey course of horticultural crops (fruits, vegetables, ornamentals) and enterprises. Includes plant science and business aspects of horticultural production and service industries, and introduces related issues and emerging technologies such as work force characteristics, organic production, and biotechnology. I. (2H,2C)

2234: ENVIRONMENTAL FACTORS IN HORTICULTURE
Principles and practices in managing environmental factors - temperature, water, light, atmospheric gases and pollutants, and soil and minerals - that influence growth and production of horticultural plants. (3H,3C) II.

2244: PLANT PROPAGATION
Principles and practices of plant propagation by sexual and asexual methods.
(2H,2L,3C) II.

2304 (BIOL 2304): PLANT BIOLOGY
Introductory botany. Form, growth, function, reproduction, and ecological adaptations of major groups of plants. Pre: BIOL 1105, BIOL 1106. (3H,3C) I,II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114 (FST 3114): WINES AND VINES
Principles and standard practices of wine grape production, processing, and sensory evaluation for students with a professional interest in premium table wines. Junior standing and instructor consent required. (2H,2L,3C) II.

3264: HORTICULTURAL THERAPY
In depth study of the application of horticultural activities to therapy and rehabilitation of handicapped individuals. Attention given to understanding problems of the handicapped and specific horticultural activities used in therapeutic programs. (2H,3L,3C) II.

3325-3326: WOODY LANDSCAPE PLANTS
Functions, growing requirements, hardiness, problems, and methods of identification of landscape plant materials. 3325: Commonly available woody

landscape plants. 3326: Native and rare woody landscape plants. Junior standing required. I (2H,3L,3C)

3345,3346: HERBACEOUS LANDSCAPE PLANTS
Identification, growing requirements, culture, landscape use, flowering and dormancy physiology, and unique propagation of native and exotic herbaceous plants for temperate environments. 3345: Summer and fall-flowering ornamental annuals and perennials; cultivated wildflower, wetland, and aquatic systems. 3346: Winter and spring-flowering species and related herbaceous foliage plants. Junior standing required. Pre: 2244. (1H,3L,2C) 3345: I:3345. II:3346; 3346:

3354 (FOR 3354): URBAN FORESTRY
A study of the function, culture, and management of trees in an urban environment, with emphasis on tree value and the implementation of biological and ecological concepts to minimize maintenance and maximize utility in urban areas. I Pre: or (3326). (2H,3L,3C)

3524 (LAR 3524): HISTORY OF LANDSCAPE ARCHITECTURE
A study of the design-form and structure of landscape architectural works from the Bronze Age to the present, including the influence of physical, climatological, and social context, and of the individual designers. Junior standing required. I (3H,3C)

3544: LANDSCAPE CONSTRUCTION
Survey of landscape construction materials and methods. Concentration on small scale and residential applications, innovative uses, and cost estimates. (1H,3L,2C) I,II.

3574: LANDSCAPE IRRIGATION
Principles and practices in landscape irrigation system design and operation. Junior standing required. (1H,3L,2C)

3584: LANDSCAPE CONTRACTING PRACTICUM
The development of practical skills in landscape contracting. The course will rotate between design and installation of water gardens, landscape irrigation systems, landscape lighting or other pertinent topics on consecutive years. The course can be repeated for exposure to specific subjects to maximum of 3 credits. Junior standing required. Pass/Fail only. Pre: 2224, 2234. (3L,1C)

3644: LANDSCAPE ESTABLISHMENT AND MAINTENANCE
The principles and practices involved in the establishment and care of private, public, industrial, and institutional landscapes. I Pre: 2224, 2244. (2H,3L,3C)

4004: HORTICULTURE SEMINAR
Assessment of fundamental horticultural skills developed through academics and employment. Includes career placement preparation and problem solving through research and production project design and implementation using a team approach. Junior standing required. (1H,1C)

4205,4206: PUBLIC GARDENS MAINTENANCE AND MANAGEMENT
4205: Principles and practices of winter annuals and spring blooming bulb production and installation; water garden cultivation and systems maintenance; fall fertilization programming; vegetative waste management; information dissemination and communication methods for public outreach including education, interpretive programs, and fundraising. 4206: Principles and practices of pruning, summer annual production; soil amendment and protection; plant collections/accessions curation and database management; personnel and financial management issues unique to public gardens. Pre: Junior standing required. (3L,1C)

4304: CONTEMPORARY ISSUES IN PLANT MATERIALS USE
The far-reaching impact of decisions concerning the selection, propagation, and placement of ornamental herbaceous and woody plant materials in cultivated landscapes will be addressed through a discussion and writing-intensive approach. Voluntary and legislative efforts initiated by horticulturists and other plant specialists at the local, state, federal and global levels will be discussed, encompassing such topics as invasive exotic plants, rare and endangered species, and the development/release of new plant varieties. Instructor consent required. Pre: 2144 or 3325 or 3326 or 3345 or 3346. (3H,3C) II.

4324: GREENHOUSE MANAGEMENT
For persons who intend to manage or advise those managing greenhouses. Includes greenhouse construction, environmental controls, disease/ insect identification and management, control of plant growth, root-zone management, and marketing and management principles specific to greenhouse operations. Pre: Coursework or experience in plant growth and environmental management required. (3H,3C)

4424: FLORICULTURE CROPS
An advanced study of the physiological principles and commercial practices involved in the production of potted, bedding, and cut floral crops, as well as an overview of the physical systems involved in greenhouse crop production. Pre: 2234, 2244, 4324. (2H,3L,3C)

4545-4546: SMALL SCALE AND RESIDENTIAL LANDSCAPE DESIGN
Development of graphic skills with concentration on a variety of media and techniques. Basic theory and principles on design of small scale and residential landscapes with emphasis on spatial composition, user needs, ecology, and uses of plant materials and light construction. 4545, I; 4546, II. Pre: 3325, 3544 for 4545; 3325, 3544, 4545, 4545 for 4546. (2H,6L,4C)

4664: NURSERY CROPS
Production principles and practices used for growing woody plants in the field and in containers along with the strategies for wholesale and retail marketing of nursery crops. I Pre: 2234, 2244. (3H,3C)

4674: NURSERY CROPS LABORATORY
Development of horticultural skills associated with production and marketing of nursery crops. I Co: 4664. (3L,1C)

4704: FRUIT CROPS

Principles and practices in the production of important temperate tree and small fruit crops. Major emphasis on apple, peach, grape, strawberry and blueberry; lesser emphasis on pear, cherry, plum, brambles, cranberry, gooseberry, and currant. I. Pre: 2234. (3H,3C)

4714: FRUIT CROPS LABORATORY
Laboratory, orchard, and field study of principles and practices related to commercial production of important temperate tree fruit and small fruit crops. I. Co: 4704. (3L,1C)

4774: VEGETABLE CROPS LABORATORY
Laboratory and field study of principles and practices related to the production of vegetables. Cultural practices, production equipment, seed and varietal characteristics, and quality evaluation will be emphasized. I Co: 4764. (3L,1C)

4784: VEGETABLE SEED PRODUCTION
The study of production agriculture or reproductive biology. Seed production, handling, identification, conditioning, enhancement, packaging, storage, testing, federal standards, and biotechnology. Pre: 4764 or 2244 or equivalent experience in vegetable crops, plant propagation, or plant growth and development. Pre: 4764 or 2244. (2H,2C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Agriculture and Life Sciences

Human Nutrition, Foods, and Exercise

www.hnfe.vt.edu/

Susan Hutson, Head
Professors: S. M. Hutson; J. W. Rankin; J. H. Williams
Associate Professors: W. E. Barbeau; S. F. Clark; B. M. Davy; K. P. Davy; P. A. Estabrooks; D. J. Good; R. W. Grange; E. M. Schmelz; E.L. Serrano
Assistant Professors: M. Frisard; M. W. Hulver; Y. H. Ju; D. Liu
Senior Instructor: C. B. Papillon
Instructors: L. Bianchi; H. Cox; N. Girmes-Grieco; J. L. Hill; K. Osterberg
Research Associates: M.M. McFerren
Adjuncts: F. D. Conforti; W. G. Herbert; M. Lewis
Undergraduate Coordinator: Laurie Bianchi (231-5987)

Overview

Nutrition, foods, and exercise science is a unique field of study that builds on the biological and physical sciences. Human nutrition is directed toward helping people choose food that meets their physiological needs and is consistent with their lifestyles and cultural preferences. Changes in lifestyle and food consumption patterns have created consumer demand for new food products that are shelf stable, require little or no preparation, and are appropriate in nutrition content. These trends have increased the need for food professionals who wish to apply their science background to exploring the nutrient content and chemical and physical properties of foods and food ingredients. Increasing interest in physical fitness and wellness has brought about new professional opportunities in assisting people who want to develop appropriate exercise patterns and make healthy changes in their lifestyle.

Many contemporary health issues including obesity, heart disease, and cancer have been associated with a person's food intake and level of exercise. This has led to increasing emphasis on health promotion and disease intervention, and the nutrition or exercise professional has become a member of the health care team. Expanding research by both private and government agencies focusing on the role of nutrition and physical activity in health, growth, and aging has created a demand for graduates at the B.S., M.S., and Ph.D. levels who have a background and interest in laboratory and experimental methods in nutrition, foods and exercise science. The current interest in physical performance in our society has broadened the opportunities for combining expertise in nutrition with exercise and fitness for those with skills in counseling and entrepreneurship. Individuals with a background in food and nutrition are needed to help solve the problems of world hunger and food shortages, and the accompanying loss of human potential.

There are four options from which an undergraduate student majoring in human nutrition, foods and exercise may choose: Dietetics; Science of Food, Nutrition and Exercise; Consumer Foods; or Exercise and Health Promotion.

The department participates in the University's Cooperative Education Program and Honors Program (see "Academics" in this catalog). The department offers graduate programs leading to the M.S. and Ph.D. with options in Nutrition, Foods, Community and International Nutrition, Clinical Exercise Physiology, Nutrition in Sports and Chronic Disease; and Muscle Function and Biochemistry.

Program Requirements	**(C)**
Curriculum for Liberal Education	(36)
Area 1: ENGL 1105-1106: Freshman English or COMM 1015, 1016 Communication Skills	3, 3
Area 2: From university-approved list of courses	3, 3
Area 3: PSYC 2004: Introductory Psychology and a PSYC course from university-approved list	3, 3
Area 4: CHEM 1035-1036: General Chemistry	3, 3
CHEM 1045-1046: General Chemistry Lab	1, 1
Area 5: MATH 1015-1016: Elem. Calculus with Trig.I	3, 3

Area 6: Any university-approved Liberal Education course in this area	1
Area 7: Any university-approved Liberal Education course in this area	3
The Department Core	(42)
HNFE 1004: Foods and Nutrition	3
HNFE 1114: Orientation to HNFE	1
HNFE 2014: Nutrition Across the Life Span	3
BIOL 1105, 1115: Principles of Biology and Lab	3, 1
BIOL 1106, 1116: Principles of Biology and Lab	3, 1
BMSP 2135, 2136: Human Anatomy and Physiology	3, 3
CHEM 2514: Survey of Organic Chemistry ***or*** CHEM 2535: Organic Chemistry[1]	3
BCHM 2024: Concepts of Biochemistry	3
COMM 2004: Public Speaking	3
STAT 2004 Introductory Statistics[2]	3
HNFE 3025-3026: Metabolic Nutrition	3, 3
HNFE 4004: Seminar in HNFE	3

[1] Science of Food, Nutrition and Exercise students must take CHEM 2535.

[2] Science of Food, Nutrition and Exercise students may take STAT 3615 Biological Statistics instead of STAT 2004 Introductory Statistics.

Additional courses required for each of the options in human nutrition and foods are listed in the appropriate sections below.

Dietetics

Consult: S. F. Clark

The undergraduate Dietetics option, known as the Didactic Program in Dietetics (DPD), leads to a Bachelor of Science degree in Human Nutrition, Foods and Exercise. It fulfills all academic course requirements according to the Standards of Education per the Commission on Accreditation for Dietetics Education of The American Dietetic Association (120 South Riverside Plaza, Suite 2000, Chicago, Illinois 60606-6995, 312/899-0040). Students completing this degree program are eligible to apply for acceptance into Dietetic Internship programs at Virginia Tech and elsewhere. Following completion of the BS in Dietetics, a student must then complete a supervised practice, dietetic internship; successful completion of any accredited dietetic internship qualifies one to sit for the registration examination to become a registered dietitian (RD) and/or licensed.

Registered Dietitians work in a variety of work settings. The dietetics program prepares you to assume a professional role in health care, research, the business environment or to pursue graduate studies. The dietetics program ultimately prepares you to assume a professional role in a health care, research, or business setting or to go on to graduate school. Clinical dietitians in hospitals and out-patient clinics provide care to individuals with disease-related nutritional problems. Community dietitians may work in health clubs specializing in sports nutrition, in work site wellness programs, or in community programs serving mothers and children, low-income families, or elderly people. Others work for food companies dealing with consumer questions about the nutrient content of food products, or with companies manufacturing nutritional supplements or other medical or health products. Administrative Dietitians with management or business interests find positions in food service management in health care facilities, work site, college, or university food service, or hotels and resorts. Registered Dietitians counsel people of all ages, cultural and ethnic backgrounds, and levels of education.

The dietetics option fulfills all academic course requirements for a Didactic Program in Dietetics per the Commission on Accreditation for Dietetics Education (CADE). Following completion of the B.S. degree, a student must complete a supervised practice to be eligible for the Registration Examination (RD) for Dietitians. The supervised practice requirement can be met through any CADE accredited dietetic internship. Graduates with the B.S. in Dietetics are eligible to apply for the department's or other accredited Dietetic Internships.

Students in the Dietetics option must maintain an overall GPA of 3.0 to remain in this option. Students who want to change their major into the Dietetics option with HNFE must have an overall GPA of 3.0 also.

ACIS 2004: Survey of Accounting Concepts	3
PSYC 2084: Social Psychology [1]	3
HNFE 2004: Professional Dietetics	1
HNFE 2234: Food Selection and Preparation	2
HNFE 2224: Food Selection and Preparation Lab	1
BIOL 2604: General Microbiology	3
BIOL 2614: General Microbiology Lab	1

HNFE 3034: Methods of Human Nutritional Assessment	2
HNFE 3114: Foodservice & Meal Management	4
HNFE 3224: Communicating w/ Food	3
HNFE 3234: Science of Food	4
MGT 3304: Management Theory and Leadership Practice	3
HNFE 4644: Health Counseling	3
HNFE 4125-4126 Medical Nutrition Therapy	3, 3
HNFE 4624: Community Nutrition	3
Free Electives to meet graduation requirements	3
[1]May be taken as part of the Curriculum for Liberal Education area 2.	

TOP

Science of Food, Nutrition, and Exercise

Consult: Laurie Bianchi

This option provides an opportunity for the student who enjoys science and is interested in research to apply this interest to the study of the processes related to the foods we eat and the life functions of the human body. The chief difference between this course of study and others in the department is the greater depth of study in the biological and physical sciences.

Upon completion of this option a student is well prepared for graduate work in any area of nutrition, food science, exercise physiology, or related sciences. This option also meets entrance requirements for most medical, dental, physical therapy, and pharmacy schools. Among the employment opportunities for the graduate with a B.S. degree are entry level positions in research and development with a company manufacturing nutritional, health and exercise, or medical products, in the food industry in food product testing or quality control, or in a position related to clinical exercise physiology. With the growing attention to the role of nutrition and exercise in health promotion and disease prevention, this option is especially appropriate for the student preparing for a career in medicine, physical therapy, or a related health field.

Students in the SFNE option do not meet the CADE requirements for a degree in dietetics and, therefore, cannot be issued a Verification Statement saying that they have met all the CADE requirements unless they have a double option with Dietetics.

PHYS 2205-2206: General Physics	3, 3
PHYS 2215-2216: General Physics Laboratory	1, 1
CHEM 2536: Organic Chemistry	3
CHEM 2545-2546: Organic Chemistry Laboratory	1, 1
HNFE 3034: Methods in Human Nutritional Assessment	2
BMSP 2145, 2146: Human Anatomy and Physiology Lab	1,1
BIOL 2604: General Microbiology ***or*** BIOL 2104: Cell and Molecular Biology	3
Individual learning experiences chosen from:	
HNFE 4254, 4964, 4974, 4994 and FST 4514	2
Controlled Electives (select 15 hours from this group of courses):	
BIOL 2614: General Microbiology Laboratory	1
BIOL 2004: Genetics	3
BIOL 3124 Cell Physiology	3
BIOL 4604 Food Microbiology	4
BCHM 3114 Biochemistry for Biotechnology and the Life Sciences	3
HNFE 2234: Food Selection and Preparation	2
HNFE 2224: Food Selection and Preparation Laboratory	1
HNFE 2824: Prevention and Care of Athletic Injuries	2
HNFE 3234: Science of Food	4
HNFE 3824: Kinesiology	3

HNFE 3864: Concepts of Preventive & Therapeutic Exercise	2
HNFE 3804: Exercise Physiology	3
HNFE 3634 Epidemiological Concepts of Health and Disease	3
HNFE 4644 Health Counseling	3
HNFE 4174 Nutrition and Physical Performance	2
HNFE 4224 Alternative and Complementary Nutrition Therapies	2
HNFE 4844 Exercise and Neuromuscular Performance	3
CHEM 2114: Analytical Chemistry for the Life Sciences	3
CHEM 2124: Analytical Chemistry for the Life Sciences Lab	1
CHEM 4554 Drug Chemistry	3
STAT 3616 Biological Statistics	3
BMVS 4074: Pharmacology	3
Free Electives to meet graduation requirements	6

Consumer Foods

Consult: W. E. Barbeau

Positions held by graduates of this option may include director of a test kitchen, editor of food communications for magazines and newspapers, food research assistant, or public relations consultant for a food company.

This option prepares you with an in-depth background of foods and nutrition combined with academic preparation in marketing, communications, and management. Numerous career possibilities with food companies or food promotion in positions that involve communication of food and nutrition information to consumers are open to you on completion of requirements.

Field experience or visits to the food industry are very helpful. This curriculum includes a consumer foods tour, conducted each spring, to a major city to visit food professionals in food industries, food product promotion agencies, food retail businesses, government agencies, and television networks. Tours in the past have included visits to Wendy's Headquarters, Center for Disease Control, Big Bear Supermarkets, the Cable News Network (CNN), Coca-Cola, and the Southeastern Dairy Association.

Students in the CF option do not meet the CADE requirements for a degree in dietetics and, therefore, cannot be issued a Verification Statement saying that they have met all the CADE requirements unless they have a double option with Dietetics.

HNFE 2234: Food Selection and Preparation	2
HNFE 2224: Food Selection and Preparation Laboratory	1
BIOL 2604: General Microbiology	3
BIOL 2614: General Microbiology Laboratory	1
AHRM 2404: Consumer Rights	3
ENGL 3674: Technical Writing	3
HNFE 3224: Communicating with Food	3
HNFE 3234: Science of Food	4
MGT 3304: Management Theory and Practice	3
MKTG 3104: Marketing Management	3
HNFE 4254: Experimental Foods	2
FST/BIOL 4604: Food Microbiology	4
HNFE 4974: Independent Study	3
Electives to meet graduation requirements	8

Exercise and Health Promotion

Consult: J. W. Rankin

This option is designed for the student who is interested in learning how to help people develop a healthy lifestyle through exercise and

health promotion. Students will learn how to integrate and apply the principles associated with exercise, nutrition, and health promotion in the prevention and therapeutic treatment of problems related to health. The basic foundation for this option is the set of knowledge, skills, and abilities specified by the American College of Sports Medicine for certification as a Certified Health Fitness Specialist.

This major prepares you for an entry level position in the area of wellness - ranging from commercial weight loss programs to wellness programs at the corporate level. Graduates are qualified to take positions in private health clubs, physical fitness centers, corporate and institutional wellness programs, physical therapy clinics, and cardiac rehabilitation programs. Many alumni decide after gaining some work experience to continue your studies at the graduate level in clinical exercise physiology or health education.

Students in the EHP option do not meet the CADE requirements for a degree in dietetics and, therefore, cannot be issued a Verification Statement saying that they have met all the CADE requirements unless they have a double option with Dietetics.

Select 3 credits from the following basic instruction courses:
1194, 1214, 1264, 1294, 1354, 1364, 1374

HNFE 2824 Prevention and Care of Athletic Injuries	2
PHYS 2205: General Physics I	3
HNFE 3824: Kinesiology	3
HNFE 3864: Concepts of Preventive & Therapeutic Exercise	2
HNFE 3874: Clinical Exercise Physiology	2
HNFE 3634: Epidemiologic Concepts of Health and Disease	3
HNFE 4644: Health Counseling	3
HNFE 3804: Exercise Physiology	3
HNFE 4174: Nutrition and Physical Performance	2
or HNFE 4844: Exercise and Neuromuscular Performance	3
STAT 2004: Introductory Statistics	3
HNFE 4834: Applications in Clinical Exercise Programs	3
HNFE 4854: Internship in Exercise & Health Promotiony	3
Free Electives to meet graduation requirements	8

TOP

Satisfactory Progress Towards the Degree

An HNFE student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed:

30 hours with

- CHEM 1035, 1036 with grades of C or higher
- HNFE 1004 with a grade of C or higher
- An overall GPA 2.5
- And an in-major GPA 2.5

At this point the student should declare an option within HNFE. A plan of study should be submitted along with your option declaration.

- Consumer Foods
- Dietetics
- Exercise & Health Promotion
- Science of Food, Nutrition & Exercise

If a student wishes to double major (or double option) he/she will need to have a GPA at or above 3.0

Consumer Foods:

An HNFE-CF option student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed:

45 hours

- HNFE 1004 (Foods & Nutrition) with a grade of C or higher
- An overall GPA > 2.5
- And an in-major GPA > 2.5

60 hours

- CHEM 2514 (Survey of Organic Chemistry) or CHEM 2535 (Organic Chemistry) with a grade of C or higher
- HNFE 2014, Nutrition Across the Lifespan
- HNFE 2234, Food Selection & Preparation and HNFE 2224, Food Selection & Preparation Lab
- An overall GPA > 2.5
- And an in-major GPA > 2.5

90 hours

- BMSP 2135, 2136 Anatomy & Physiology
- BCHM 2024, Concepts of Biochemistry
- An overall GPA > 2.5
- And an in-major GPA > 2.5

Dietetics:

An HNFE-DIET option student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed:

45 hours

- CHEM 2514 (Survey of Organic Chemistry) or CHEM 2535 (Organic Chemistry) with a grade of C or higher
- HNFE 1004 (Foods & Nutrition) with a grade of C or higher
- An overall GPA > 3.0
- And an in-major GPA > 2.5

60 hours

- BCHM 2024, Concepts of Biochemistry
- HNFE 2014, Nutrition Across the Lifespan
- HNFE 2004, Professional Dietetics
- HNFE 2234, Food Selection & Preparation and HNFE 2224, Food Selection & Preparation Lab
- BMSP 2135, 2136 Anatomy & Physiology
- An overall GPA > 3.0
- And an in-major GPA > 2.5

90 hours

- HNFE 3025, 3026 Metabolic Nutrition
- An overall GPA > 3.0
- And an in-major GPA > 2.5

Exercise & Health Promotion:

An HNFE-EHP option student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed:

45 hours

- HNFE 1004 (Foods & Nutrition) with a grade of C or higher
- An overall GPA > 2.5
- And an in-major GPA > 2.5

60 hours

- CHEM 2514 (Survey of Organic Chemistry) or CHEM 2535 (Organic Chemistry) with a grade of C or higher
- An overall GPA > 2.5
- And an in-major GPA > 2.5

90 hours

- BMSP 2135, 2136 Anatomy & Physiology
- HNFE 2014, Nutrition Across the Lifespan
- BCHM 2024, Concepts of Biochemistry
- HNFE 3864, Concepts of Preventative & Therapeutic Exercise
- HNFE 3874, Clinical Exercise Physiology
- An overall GPA > 2.5
- And an in-major GPA > 2.5

Science of Food, Nutrition & Exercise:

An HNFE-SFNE option student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed:

45 hours

- HNFE 1004 (Foods & Nutrition) with a grade of C or higher
- An overall GPA > 2.5
- And an in-major GPA > 2.5

60 hours

- CHEM 2514 (Survey of Organic Chemistry) or CHEM 2535 (Organic Chemistry) with a grade of C or higher
- An overall GPA > 2.5
- And an in-major GPA > 2.5

90 hours

- BMSP 2135, 2136 Anatomy & Physiology
- HNFE 2014, Nutrition Across the Lifespan
- BCHM 2024, Concepts of Biochemistry
- An overall GPA > 2.5
- And an in-major GPA > 2.5

Students not meeting Satisfactory Progress will have one probationary semester in which to resolve their standing.

Restricted Major status: Current Virginia Tech students who wish to change majors into HNFE (or add as a 2nd major) will be required to have an overall GPA at or above 2.5 (3.0 for Dietetics and double major or double option), have completed CHEM 1035 and CHEM 1036 with grades of C or higher, and create a plan of study that demonstrates how the student will attain Satisfactory Progress in regards to coursework. The GPA threshold of 2.5 (3.0 for Dietetics option) will stand for all students regardless of transfer status. Satisfactory progress towards degree is enforced.

TOP

Undergraduate Course Descriptions (HNFE)

Courses (HNFE)
1004: FOODS AND NUTRITION
Scientific information applied to current concerns in foods and nutrition as it affects the nutritional health and well-being of humans. (3H,3C) I,II.

1114: ORIENTATION TO HNFE
An introduction to the academic and career planning for students in the Human Nutrition, Foods & Exercise major. (1H,1C)

1164: GOLF
This course will provide basic instruction in the fundamentals of golf. Pass/Fail only. (3L,1C)

1194: TENNIS
This course will provide basic instruction in the fundamentals of tennis. Pass/Fail only. (3L,1C)

1214: WEIGHT TRAINING
This course is designed to enhance muscular function to enable one to engage in activities requiring greater than normal levels of muscular development. Pass/Fail only. (3L,1C)

1244: VOLLEYBALL
This course will provide basic instruction in the fundamentals of volleyball. Pass/Fail only. (3L,1C)

1264: RACQUETBALL

This course will provide basic instruction in the fundamentals of racquetball. Pass/Fail only. (3L,1C)

1314: AQUATIC AEROBICS
The course will provide basic instruction in the fundamentals of aquatic exercise and water aerobic skills. Pass/Fail only. (3L,1C)

1324: BEGINNING SWIMMING
This course will provide basic instruction in the fundamentals of swimming. Pass/Fail only. (3L,1C)

1344: FITNESS SWIMMING
The course will provide basic instruction in the fundamentals of American Red Cross fitness swimming. Pass/Fail only. (3L,1C)

1364: EXERCISE AND WEIGHT CONTROL
This course will teach the concepts and skills required to use exercise for weight reduction. Each student will assess body fat, activity patterns and diet, and use this information to develop an individual exercise and dietary plan for weight reduction. Pass/Fail only. (3L,1C)

2004: PROFESSIONAL DIETETICS
Introduction to the profession of dietetics with emphasis on competencies, preparation, and responsibilities associated with dietetic practice. Overview of the structure of The American Dietetic Association (ADA) and its relationship to the dietetic professional. Discussion of current professional concerns. Co: 2014. (1H,1C) II.

2014: NUTRITION ACROSS THE LIFE SPAN
Nutritional requirements and related health concerns of pregnant and lactating women, infants, children, adults and the elderly are studied in relation to the physiological and metabolic aspects of pregnancy, lactation, growth and development, maintenance of health, prevention of disease, and aging. 1 year of biology or chemistry required. Pre: 1004, CHEM 1035, CHEM 1036. (3H,3C) II.

2224: FOOD SELECTION AND PREPARATION LABORATORY
Principles of food preparation and the effect on food quality determined by objective and sensory evaluation. Food choices at the market and consumer consumption and utilization. Pre: (CHEM 1036 or CHEM 1056), HNFE 1004. Co: 2234. (3L,1C) I,II.

2234: FOOD SELECTION AND PREPARATION
Principles of the selection and preparation of foods with emphasis on the preparation and the effect on flavor, texture, and nutritive properties of food. Pre: (CHEM 1035 or CHEM 1055), (CHEM 1036 or CHEM 1056), HNFE 1004. Co: 2224.
(2H,2C) I,II.

2544 (FST 2544): FUNCTIONAL FOODS FOR HEALTH
Introduction to functional foods (foods with additional value beyond basic nutrition) including development of functional foods, novel sources, and traditional foods with value-added health benefit; regulatory issues; and media messages. (3H,3C)

2824: PREVENTION AND CARE OF ATHLETIC INJURIES
An introduction to the techniques and principles of athletic training. (1H,3L,2C) I,II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014: FNW STUDY TOUR
Study of emerging career opportunities in industry, government, and other nonprofit agencies, health care, consumer education, and research for students in foods, nutrition or exercise science. Special emphasis on program or product development, evaluation, and marketing as related to a target consumer group. Seminars on campus and at prearranged locations during the two day tour. Junior standing or permission; HNFE majors only. II. (1H,1C)

3025-3026: METABOLIC NUTRITION
Study of essential nutrients with emphasis on sources and factors affecting utilization and metabolism. 3025: Transport and utilization of the macro- and micro-nutrients. Metabolism of the macronutrients and interrelationships with each other and the micronutrients (vitamins/minerals) with emphasis on energy metabolism. 3026: Protein and amino acid dietary requirements and evaluation of protein quality. Vitamin/mineral metabolism and interrelationships will be emphasized. Nutrient metabolism, related to several metabolic states and diseases, will be examined. I Pre: 2014, BCHM 2024, (BIOL 2405, BIOL 2406) or (BMSP 2135, BMSP 2136) for 3025; 3025 for 3026. (3H,3C)

3034: METHODS OF HUMAN NUTRITIONAL ASSESSMENT
Laboratory projects and experiments related to nutrition principles and problems. Pre: 2014, BCHM 2024, (BMSP 2136 or BIOL 2406). Co: 3025. (1H,3L,2C) II.

3114: FOODSERVICE AND MEAL MANAGEMENT
Foodservice and meal management for the dietetics professional. Emphasis is placed on understanding food procurement, production, distribution, and marketing in a safe and well managed operation. Pre: 2234, 2224. (3H,3L,4C)

3224: COMMUNICATING WITH FOOD
Development of oral and written communication skills to communicate food and nutrition information to diverse populations. Pre: 2014, 2234, 2224. (2H,3L,3C)

3234: SCIENCE OF FOOD
Theoretical and experimental study of food components with emphasis on the basic chemical and physical reactions, properties, interactions, and functions in foods. I Pre: 2234, 2224, (CHEM 2535 or CHEM 2514). (3H,3L,4C)

3634: EPIDEMIOLOGIC CONCEPTS OF HEALTH AND DISEASE
Designed to give students in the health sciences a basic understanding of the modern concepts regarding health and disease as well as skills in organizing epidemiological data, disease investigation and surveillance. Includes a survey of terms, concepts, and principles pertinent to epidemiology. Lifestyles of populations and the relationships between lifestyles and health status are studied. (3H,3C) II.

3804: EXERCISE PHYSIOLOGY
Effects of exercise on physiology: neuromuscular, metabolic, cardiopulmonary. Scientific basis of physical training. I Pre: (BIOL 2405, BIOL 2406) or (BMSP 2135, BMSP 2136). (3H,3C)

3824: KINESIOLOGY
The anatomical and biomechanical basis of human motion, with applications for motor skill acquisition, and development and rehabilitative exercises. I Pre: (BIOL 2405, BIOL 2406) or (BMSP 2135, BMSP 2136), (PHYS 2205 or PHYS 2305). (3H,3C)

3864: CONCEPTS OF PREVENTIVE AND THERAPEUTIC EXERCISE
Fundamental principles of exercise and health behavior for adults. Focus is on exercise and risk factor modification techniques for promotion of health, prevention of disease, and for disease rehabilitation. I (2H,2C)

3874: CLINICAL EXERCISE PHYSIOLOGY
Pathophysiology, function and exercise in populations with medical considerations. Emphasis on basics of assessment and interpretation for health screening, multi-component physical fitness testing, exercise electrocardiography, therapeutic medications, and supervision in exercise programs designed for disease prevention. Pre: 3864. (1H,3L,2C) II.

4004: SEMINAR IN HNFE: WRITING AND DISCOURSE IN THE MAJOR
Focused review of relevant and current literature in selected areas of food, nutrition and exercise. Develop practical strategies for finding research articles on specific topics utilizing a variety of search tools (e.g., library, on-line search engines, etc.). Develop analytical skills to critically assess the significance of published research data. Develop competence in written and verbal presentation of current research in formats suitable for a scientific or a lay audience. Pre: 3025. (3H,3C)

4125-4126: MEDICAL NUTRITION THERAPY
Study of nutritional diagnostic, therapeutic and counseling services provided by a registered dietitian. 4125: Emphasis on the relationship between principles of nutritional care and the medical treatment of individuals with selected diseases or clinical problems. 4126: Integration of knowledge of pathophysiology, biochemical, and clinical parameters, medical treatment and nutrition therapy for patients with selected clinical problems/disease states. 4125: I. 4126: II Pre: 2004, 3026 for 4125; 4125 for 4126. Co: 3034 for 4125. (3H,3C)

4134: EXPERIENTIAL APPROACH TO NUTRITIONAL THERAPY
Use of didactic and experiential methods to learn and apply theories of behavior change in diverse nutrition counseling situations. Pre: Instructor approval. I Pre: 4644. Co: 4125. (2H,2C)

4174: NUTRITION AND PHYSICAL PERFORMANCE
Interaction of human nutrition with exercise physiology. Nutritional principles applied to the well being of the athlete and to the optimization of exercise performance. Pre: 1004, 3804. (2H,2C) II.

4224: ALTERNATIVE AND COMPLEMENTARY NUTRITION THERAPIES
Critical evaluation of health claims, mechanisms of action, and research literature for a wide variety of unconventional nutrition therapies used for disease prevention and treatment. Practical application of knowledge through completion of problem-based learning projects. II. Pre: 3025. (2H,2C)

4254: EXPERIMENTAL FOODS
Experimental study of the functions of ingredients and factors affecting food quality with emphasis on an independent project. Pre: 3234. (1H,3L,2C) II.

4614: INTERNATIONAL NUTRITION IN DEVELOPING COUNTRIES
An analysis of the micro and macro determinants of malnutrition and poor quality of life of households in developing countries and of strategies designed to address the problems. I Pre: 1004. (3H,3C)

4624: COMMUNITY NUTRITION
The application of nutrition principles to an analysis of current applied nutrition programs and a study of the political and legislative processes affecting the practice of dietetics. I Pre: 2014, 3026. (3H,3C)

4634: SOCIO-CULTURAL FOOD SYSTEMS
Study of social, cultural, and economic aspects of food systems, using quantitative and qualitative methods to assess nutritional status. I Pre: 1004, SOC 3004. (2H,2L,3C)

4644: HEALTH COUNSELING
Roles, responsibilities, and limitations of the professional health educator in health counseling, guidance and referral, health needs assessment, dynamics of health counseling interaction, and selected counseling techniques such as crisis intervention and value clarification. Junior standing required. (3H,3C)
II.

4834: APPLICATIONS IN CLINICAL EXERCISE
Supervised experience with the Therapeutic Exercise and Community Health Center. Direct Involvement with rehabilitative and preventive exercise and lifestyle programming for cardio-vascular, musculo-skeletal, and other conditions. Exercise leadership, case management, and daily operations. Included seminars, lab experience, and individual meetings with participants and supervisors, related projects. X-grade allowed. Pre: 3874. (9L,3C)

4844: EXERCISE AND NEUROMUSCULAR PERFORMANCE
Functional properties of the neuromuscular system. Emphasis placed on the acute and chronic responses of muscle in exercise, rehabilitation and the factors which determine human performance. Special emphasis on the molecular biological factors responsible for skeletal muscle development and differentiation, as well as adaptation to training and disease states, including activation of signal cascades responsible for the changes in muscle performance. Pre: 3804. (3H,3C) II.

4854: INTERN IN EX SCI & HEALTH PROM
Capstone internship experience in the fields of exercise science and/or health promotion. The student will be immersed in the day-to-day challenges and responsibilities of a practicing health-fitness professional. The 45 contact hours per credit will involve work experience in some aspect of exercise science and/or health promotion. Senior standing and Exercise and Health Promotion majors only. May be repeated for maximum 3 credits. Pass/Fail only. Variable credit course. Pre: 4834.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences

Life Sciences Undecided

John Crunkilton, Advisor
231-6503, aglifesci@vt.edu

- Overview

Overview

The College of Agriculture and Life Sciences offers a program for students who are undecided about their majors during the first two years at Virginia Tech. This flexibility allows students to explore career opportunities in different fields, to meet faculty in a variety of departments, and to investigate the wide-range of majors and options within the college as well as in the university. Working closely with an advisor in the Office of Academic Programs, students will take foundation courses required of most majors (biology, math, English and chemistry) in the college and be encouraged to take exploratory courses in various departments to sharpen their career focus. To begin this exploratory phase, students will enroll in BIOL 1044, the one credit, pass/fail course, Life Sciences in the 21st Century.

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Agriculture and Life Sciences

Plant Pathology, Physiology, and Weed Science

http://www.ppws.vt.edu/

Elizabeth A. Grabau, Head
Professors: J. F. Derr; J. D. Eisenback; E. A. Grabau; R. Grene; E.S. Hagood; C. S. Johnson; C. L. Nessler; P. M. Phipps; F. M. Shokes; E. L. Stromberg; S. A. Tolin; H. P. Wilson; K. S. Yoder
Associate Professors: S. D. Askew; A. B. Baudoin; C. Hong; J. G. Jelesko; J. M. McDowell; J. Westwood
Assistant Professors: E. Colláková; S. Okumoto; S. L. Rideout; D. G. Schmale, III; B. A. Vinatzer
Research Scientist: C. J. Denbow
Instructor: M. A. Hansen

Overview

The primary mission of the department is research, extension and graduate education in the areas of plant pathology (nature, biology and control of plant diseases), plant physiology, and weed science (weed biology and control, action of herbicides). No undergraduate majors are offered in these areas; students with an interest in plant pathology or weed science may enroll in the Departments of Crop and Soil Environmental Sciences or Horticulture, and for plant physiology also in the Department of Biology or Department of Biochemistry. The department offers several undergraduate courses that may be required or electives for students in agricultural or biological majors. These courses are designed to furnish basic knowledge of the nature, diagnosis, and control of plant diseases; identification, biology, and control of weeds; plant metabolism, nutrition, molecular biology, and growth regulation; and modern pest management and pesticide usage.

The department offers graduate programs leading to M.S. in the life sciences and Ph.D. in plant pathology, plant physiology and weed science. A non-thesis M.S. program in plant protection and pest management is also available (see Graduate Catalog).

Undergraduate Course Descriptions (PPWS)

2004: MYSTERIOUS MUSHROOMS, MALICIOUS MOLDS
This course is an examination of the fungi and their close relatives, with special attention to their roles in the natural world and in shaping the course of human history. Emphasis is placed on the historical and practical significance of fungi as sources of medicine, pathogens of plants and animals, rotters and decayers of organic matter, makers of food and drink, manufacturers of dangerous toxins, and producers of mind-altering chemicals. A student must have a basic understanding of biology. (3H,3C)

2104: DOMESTICATING THE GENE
This course explores how and why humans have manipulated plant genomes from prehistory through the current genomic era by examining the scientific, cultural, historical, and legal aspects of plant gene management in both conventional and transgenic crops. Pre: BIOL 1005 or BIOL 1105. (3H,3C)

2964: FIELD STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: PLANT PATHOLOGY
Introduction to plant pathology as a science and a crop protection discipline. Plant disease diagnosis, biology and identification of plant disease causing agents, factors leading to disease build-up, and management of plant diseases. Diseases of specific crops are discussed as examples to illustrate general principles. I Pre: BIOL 1005, BIOL 1006. (3H,3L,4C)

3444 (BIOL 3444): EXPLAINING MOLECULAR CELL BIOLOGY
This writing-intensive course will enable students to improve both their own scientific writing and their understanding of the writing of specialists, scientists in other fields and lay readers. Topics include bacterial, plant, biomedical examples of major advances in molecular cell biology and biotechnology. Includes a review of current methodologies, in-class writing workshops and problem-solving sessions, mock press conferences, individual and team presentations, and individual conferences with the instructor. Pre: BIOL 2104. (3H,3C) II.

3505,3506: PLANT PHYSIOLOGY AND THE ENVIRONMENT

Fundamental principles of plant physiology (photosynthesis, respiration, transpiration, nutrition, translocation and development) will be integrated with: abiotic (3505, water, nutrient, salinity, temperature, light, mechanical and air pollutant stresses) and biotic (3506, plant pathogens, herbivores, parasitic plants, weeds) environmental factors relative to their effects on plant physiological processes. Interaction of the abiotic and biotic environments as they influence the physiology of both natural and agricultural plants will be emphasized. Pre: (BIOL 1106 or BIOL 2304), (CHEM 1036). (3H,3C) 3505: II; 3506:

3514: PLANT PHYSIOLOGY LAB
A laboratory course designed to illustrate basic physiological principles related to nutrient deficiencies, membrane permeability and composition, water/ nutrient absorption and translocation, transpiration, photosynthesis, physiological functions of growth regulators, enzyme activity, and elemental composition of plant tissue. Co: 3504. (3L,1C) II.

4264 (ENT 4264): PESTICIDE USAGE
An interdisciplinary study of pesticides used in urban and agricultural environments. Topics studied will include: classification, toxicology, formulation, application techniques, safety, legal considerations, environmental impact, and research and development of new pesticides. Pre: CHEM 2515 or CHEM 2536. (2H,3L,3C) II.

4754: WEED SCIENCE: PRINCIPLES AND PRACTICES
Weeds and human affairs; costs and losses; emphasis on weed biology, weed identification and weed-crop ecology; agronomic, physiological, and chemical principles underlying prevention, eradication, and control of undesired vegetation; methods of weed control available for modern agronomic, forestry, horticultural, and non-crop situations. I Pre: BIOL 2304, CHEM 1036. (2H,3L,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Architecture & Urban Studies

www.caus.vt.edu

A. Jack Davis, Dean
Associate Dean for Academic Affairs: John O. Browder
Associate Dean for Research: Robert P. Schubert
Associate Dean for Graduate Studies and Outreach: Patrick A. Miller

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Overview

The College of Architecture and Urban Studies is comprised of three Schools. The School of Architecture + Design includes accredited undergraduate and graduate programs in architecture, landscape architecture, industrial design and interior design. The School of Public and International Affairs includes undergraduate programs in public and urban affairs and environmental policy and planning and graduate programs in public administration, public and international affairs, and urban and regional planning; and doctoral programs in public administration and public affairs and environmental design and planning. The Department of Landscape Architecture offers undergraduate and graduate degrees in Landscape Architecture. The Myers-Lawson School of Construction, the first of its kind in the nation, brings together the Department of Building Construction in the College of Architecture and Urban Studies and the Vecellio Construction Engineering and Management Program in the Via Department of Civil and Environmental Engineering, and includes undergraduate programs in building construction and in construction engineering and management; master's programs in building construction and in civil engineering with an emphasis in construction; and doctoral programs in environmental design and planning with an emphasis in construction and building science and in civil engineering with an emphasis in building construction and building science. The School of Visual Arts offers undergraduate programs in art history, studio art, and visual communication design.

These programs share a common purpose—to understand and mold the constructed world through acts of creation, design, construction, and analysis. These forces give meaning to the built environments that shape our lives.

Research and outreach programs supplement instructional efforts and are carried out through college centers and laboratories. Specialized study centers offer students and faculty members opportunities for concentrated investigations in such areas as history and theory of art and architecture, housing, metropolitan studies, community design, construction safety and health, high performance learning environments, community health, governance and accountability, public policy, women in architecture, environmental design and planning, and visual design.

The college offers a range of advanced digital technologies, including an array of rapid prototyping devices and a wide range of computing and graphic equipment in support of the instructional and research programs of the college. The Environmental Systems Laboratory and Research and Demonstration Facility (RDF) is available to faculty members and students for the conduct of research, in-depth investigations of environmental systems, prototype development, and industrial, graphic and product design. To support these endeavors, the college's Virtual Environments Laboratory (VE Lab) and the Visual Design Studio for Education, Research, Exhibition and Outreach (VDS4) are located at RDF.

The Art and Architecture Library, a branch of the University Libraries, is located in Cowgill Hall and houses more than 60,000 volumes, 200 periodicals and 65,000 architectural slides. The college also provides media facilities - VTR systems, photographic, darkroom, print making, ceramics, and cinematographic space and equipment.

The college's Washington-Alexandria Architecture Center and Northern Virginia Center in Old Town Alexandria. Virginia, provide opportunities for architecture, landscape architecture, public administration, planning, and urban design and planning undergraduate and graduate students to spend one or more semesters in the Washington, D.C. metropolitan area examining the range of design and planning problems found in large urban centers. In addition to classes, studios, and curricula at the undergraduate and graduate levels, the centers offer research and continuing education opportunities for students, faculty members, and alumni, and facilitates participation in the rich educational and cultural opportunities of the Washington, D.C. area.

The Europe Studio, based at the university's Center for European Studies and Architecture in Riva San Vitale, Switzerland, provides

undergraduate and graduate study opportunities for architecture students. Studios, seminars, and organized travel are offered. The college also sponsors an array of additional study abroad opportunities, including study-travel programs in Europe, Latin America, and Asia.

Students who wish to combine degree options within the college or with related disciplines within the university should contact the major school or department regarding special undergraduate and graduate program requirements.

A Summer Qualifying Design Lab in architecture and interior design is required for Virginia Tech students wishing to change from other Virginia Tech colleges and majors and for students transferring from other colleges into the architecture, landscape architecture, industrial design and interior design degree programs.

College of Architecture & Urban Studies

School of the Visual Arts

www.sova.vt.edu

T. Truman Capone, Director
Professors: G. S. Bickley; C. Burch-Brown; T. T. Capone; D.F. Crane; R. H. Graham; L. B. Van Hook
Associate Professors: M. Casto; A.M. Knoblauch; Y. White
Assistant Professors: M. Moseley-Christian; S. Paterson; E. Standley; D. Webster
Instructors: B. Bannan; G. Bryson; J. Rosenthal; S. Muslimani; E. M. Nugent; J. Niewald; D. Sim
Armory Art Gallery Director: D. Sim
Associate Director of Academic Advising: B. Bannan
Associate Director of VDS4: E. M. Nugent
Assistant Director of VDS4: S. Muslimani
Program Chairs: *Art and Art History:* L. B. Van Hook; *Visual Communication Design:* T. T. Capone; *Studio Arts:* R. Graham
Area Coordinators: *Creative Technologies:* D. Webster; *Foundations of Art:* E. Standley; *Visual Communication Design:* B. Hannam

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Overview

The School of Visual Arts (SOVA) offers studio-based programs in the visual arts balanced with critical study of the great art of the past and present. The faculty includes both practicing artists and scholars of art history. The School emphasizes new digital media as well as traditional artistic media. We offer B.F.A. degrees in both Visual Communication Design and Studio Arts, as well as a B.A. degree in Art History.

SOVA provides a variety of exhibitions and art events. The Armory Art Gallery exhibits work by national and regional artists. XYZ, a student-run gallery, provides students and regional artists the opportunity to create and show wide-ranging experimental work. The Collaboration for Creative Technologies in Arts and Design (CCTAD) is a cross-disciplinary initiative with Art, Music, Computer Science and Communications. A new animation and cyber studio has been designed to facilitate this new concentration.

The Visual Design Studio 4, (VDS4), a University Service Center, provides outstanding seniors with a vital professional design experience. Student interns work in a team environment under the direction of Visual Communication Design faculty to produce design work for VDS4's clients, providing professional and entrepreneurial experience rarely available to undergraduates. Through visiting artists and scholars, the School also brings students and members of the art community into dialogue with artists and critics of international prominence.

SOVA participates in the University's Study Abroad Program, which is open to students at the sophomore level or above, and combines classroom study with travel-study tours in Europe, Cuba, and Latin America.

Students in all of the degree programs in SOVA must complete the Curriculum for Liberal Education requirements.

TOP

Bachelor of Arts in Art History

Art history develops the student's ability to place a work of art in its historical, cultural, social, and political contexts by giving equal weight to the development of both analytical and visual skills. While an undergraduate concentration in art history may lead directly to graduate studies and to a career in teaching and scholarly research, there are numerous opportunities in a variety of career fields in museums, galleries, auction houses, publishing companies, and others. Because Art History is an academic program, there is no entry portfolio requirement.

Students who choose the Art History option must successfully complete 3 hours of studio art, 6 hours of ancillary course work, and the following Art History courses: ART 2384 (1 and 2), ART 2385 and 2386; ART 3084 or 3184, ART 3284 or 3384, ART 3484 or 3584, and ART 3784 or 3884; and 4 courses at the 4000 level.

Required Art History and Ancillary Courses:

Total Credit Hours: 42 for major, 120 for degree

ART 1204 Principles of Art and Design I OR ART 1404 Drawing I	3
ART 2385[1] Survey of the History of Western Art I	3
ART 2386[2] Survey of the History of Western Art II	3
Choose at least five courses total from four of the five clusters below:	
ART 3074[3] Egyptian Art & Architecture OR ART 3084[3] Greek Art & Architecture OR ART 3174[3] Archaeology OR ART 3184[3] Roman Art & Architecture	15
ART 3284[3] Medieval Art & Architecture OR ART 3384[4] Renaissance Art & Architecture OR ART 3484[4] Baroque Art & Architecture	
ART 3584[4] 19th-Century Art OR ART 3684[4] African-American Art OR ART 3884[4] American Art to 1914	
ART 3784[4] Art Since 1900 OR ART 3774[4] History of Modern Graphic Design	
ART 3064 Arts of China and Japan OR ARCH 4284 Precolumbian Art and Architecture	
ART 4484[3,4,7] Topics in Criticism and Methodology (Art History majors only) ART 4384[5,6] Topics in Art History ART 4384 Topics in Art History (under different topic) ART 4384 Topics in Art History (under different topic)	3 3 3 3
One course in History (may not be HIST 1025 or 1026)	3
One course in humanities selected from the following:	
HUM 1114 The Classical Age HUM 1124 Roman World & Early Christianity HUM 1214 The Medieval World HUM 1224 The Renaissance HUM 1314 The Enlightenment & Romanticism HUM 1324 The Modern World	3
Total Credits for Major	42

[1]ART 2385 is offered Fall Semester only
[2]ART 2386 is offered Spring Semester only
[3]Prerequisite: ART 2385 or permission of instructor
[4]Prerequisite: ART 2386 or permission of instructor
[5]Prerequisites vary depending on topic, check with instructor
[6]ART 4974 (Independent Study) may be substituted with permission from your advisor and the instructor directing the study.
[7]Fulfills Spoken, Visual Expression, Written and Spoken requirement (ViEWS)

OVERALL GPA: Students majoring in Art History must maintain a 2.0 in-major GPA.

Curriculum for Liberal Education Requirements: Requirements and options may change. Check the Undergraduate Catalog and Provost's web site for courses.

Area 1. Writing and Discourse: Selected from first-year writing courses.	6
Area 2. Ideas, Cultural Traditions, and Values The six credit hours required for Area 2 are met in-major.	6
Area 3. Society and Human Behavior	6
Area 4. Scientific Reasoning and Discovery	6
Area 5. Quantitative and Symbolic Reasoning	6

Area 6. Creativity and Aesthetic Experience The one credit hour required for Area 6 is met in-major.	1
Area 7. Critical Issues in a Global Context	3
Foreign Language Requirement College Level Two years of foreign language or equivalent from high school will substitute.	6
Total credits for Liberal Education Requirements	40

Progress toward degree

In addition to the University requirement for satisfactory progress (see Satisfactory Progress in Academics), upon completion of 72 semester credits, students must have completed all second year in-major courses with a C or higher. They must have an over all GPA of at least 2.0 to remain in the program.

Foundations of Art and Design is a year-long, entry-level intensive program that prepares students for advanced study in the visual fields of Integrative Studio Art and Visual Communications Design. The two-semester, 1000-level curriculum is made up of 15 credit hours covering principles of art and design, drawing, and digital Imaging proficiency. Completion of the entire Foundation Program is required prior to taking SOVA courses that are 2000 level or higher.

The investigation and unification of dexterity, contextual dialogue, and presentation skills are at the heart of the Foundations of Art and Design program at SOVA. Rather than isolating craft at the foundational level of study, whole elements of visual language are fostered equally. This unified approach to art and design studies aim to develop:

- Innovation and creative leadership skills
- Visual logic through multimedia
- Confidence with digital and analog crossover
- Traditional awareness applicable to contemporary tools of production

Portfolio Review

Students are required to pass the Portfolio Review process in order to be accepted to either the Visual Communications Design or the Studio Arts B.F.A. degree program. This process is competitive in order to maintain the highest academic standards possible within the program. All VCD or Studio Art courses at a 2000 level or above are restricted to students who successfully complete the first semester of Foundations and pass Portfolio Review.

The VCD and Studio Portfolio Review Committees (comprised of SOVA faculty) screen properly submitted portfolios for outstanding qualities in artistic ability, creativity, presentation skills, and overall motivation. The process takes place once a year in the late fall as a capstone event to the first semester of Foundations. Students may re-submit a portfolio for review annually as often as they wish.

Eligibility

VCD and Studio Art candidates must be currently enrolled in or have passed all three Foundation courses (ART 1204: Principles of Art & Design 1; Art 1404: Drawing 1; and Art 1604: Principles of New Media). Acceptance is contingent on successfully passing all three courses. Students must have and maintain a GPA of 3.0 or greater to enter and remain in either program. All artwork must be original and produced by the applicant. The committee encourages students to establish their portfolios with work produced during the fall Foundation courses.

Students who have been accepted into the Visual Communication Design Program begin the Visual Communication Design course sequence in the second year. From that point on, the course sequences for Studio Art and Visual Communication Design are uniquely tailored to each area.

TOP

Bachelor of Fine Arts in Studio Art

Entry into this program is restricted and requires successful completion of specific criteria. View restricted programs.

In the Studio Arts, majors can choose their emphasis from a variety of disciplines including Painting, Drawing, Ceramics, Digital/Media and Sculpture. The built-in flexibility of the studio curriculum encourages students to explore and develop their talents and interests. While specialization in the traditional sense is open to all majors, the school also encourages innovative approaches by exploring areas in which different media and disciplines fruitfully overlap or intersect. The B.F.A. in Studio Arts is specially addressed to students who plan to continue their education as artists at the graduate level.

The Bachelor of Fine Arts degree in Studio Arts is a 78 credit-hour program that enables each student to choose his or her focus from a variety of disciplines. Ceramics, drawing, painting and sculpture are all available as concentrations in the studio area. Animation, Photography, and New Media are also available as concentrations that make up the area of Creative Technologies. The program encourages the exploration of concepts in which different media and disciplines effectively overlap or intersect.

Each faculty member is dedicated to teaching, research, and outreach within his or her specific fields. The connection from professional practice to studio classroom is essential in creating applicable learning environments.

The goal of the program is to develop culture-enriching leaders and innovative visual artists. Completing an itegrated path of study in Studio Arts will result in a B.F.A. degree that is applicable to the demands of contemporary visual arts.

Portfolio review is required for entry to the Studio Arts Program. Students submit portfolios either as incoming freshmen or after completing the basic sequence of freshman level Studio Art Foundations courses. Complete information about Studio Art Portfolio Review is available on the SOVA website at http://www.sova.vt.edu.

Total 120 Credit Hours Required for Graduation

First Year: 15 hours	
ART 1204 Principles of Art & Design I (fall only)	3
ART 1404 Drawing I (fall only)	3
ART 1604 Principles of New Media Art & Design (fall only)	3
PORTFOLIO REVIEW: Required past this point. At the completion of Art 1204,1404 and 1604 students MUST submit AND pass the portfolio review to continue in the studio art program. The review will take place at the end of the fall semester. Students whose portfolios are declined may not advance in the curriculum. Declined students may reapply at the next regularly scheduled portfolio review.	
ART 1214 Principles of Art & Design II (spring only)	3
ART 1414 Drawing II: Life Drawing (spring only)	3
Successful completion of first year courses Art 1204, 1404, 1604, 1214 and 1414 are required to proceed in the program (C or better grade). These courses are prerequisites for all 2000-level studio art courses. Check with your advisor to begin to develop a focused track of study for the third and fourth year. Focus tracks might include 2-dimensional art, 3-dimensional art, animation, or new media art. All available ART courses are listed in this document under Art Electives.	
Second Year: 15 hours	
ART 2385 Survey of Western Art I (fall only)	3
ART 2386 Survey of Western Art II (spring only)	3
ART 2XXX 9 Hours of 2000-level courses on Studio Art Electives List	9
2000-level Art courses are the prerequisites for most 3000 level Art courses within a specific media area, (example Art 2524: Intro. to Painting is the prerequisite for Art 3524: Topics in Painting Media). Please check the specific prerequisites for each course requested.	
Third year: 21 hours	
ART 3784 Art Since 1900 (fall only)	3
ART 3854 Professional Studio Practices (fall only)	3
ART XXXX Art History Elective	3
ART 3XXX 12 Hours of 3000-level courses on Studio Art Electives List	12
3000-level Art courses are the prerequisites for most 4000-level Art courses. Please check the specific prerequisites for each course requested	
Fourth Year: 27 hours	
ART XXXX Art History Elective	3
ART 4894 Senior Studio (fall)	3
ART 4894 Senior Studio (spring)	3
ART XXXX Art Elective	6
ART 4XXX 12 hours of 4000-level courses on Studio Art Electives List	12

The BFA in Studio Art requires 78 hours of Art courses.

Curriculum for Liberal Education Requirements

Requirements and options may change. Consult the Undergraduate Catalog and the Provost's web site for courses.
Select from the approved Curriculum for Liberal Education Courses:

Area 1. Writing and Discourse: Select from two first-year writing courses.	6
Area 2. Ideas, Cultural Traditions, and Values	6
Area 3. Society and Human Behavior	6
Area 4. Scientific Reasoning and Discovery	6
Area 5. Quantitative and Symbolic Reasoning	6
Area 6. Creativity and Aesthetic Experience Covered by in Art Major by Art 2385	1
Area 7. Critical Issues in a Global Context	3

Foreign Language Requirement – Six semester hours of college level Foreign Language or equivalent from high school will substitute

Satisfactory Progress Toward Degree

Students must successfully pass portfolio review in either Studio Art or Visual Communication Design to take any course above Art 1604. In addition to the University requirement for satisfactory progress (see "Satisfactory Progress in Academics" chapter of Undergraduate Catalog), upon completion of 72 semester credits, students must have completed all second year in-major courses with a C or higher grade. They must maintain a GPA of at least 2.0.

Studio Art Electives:	Art History Electives- 6 credit hours:
ART 2524 INTRO TO PAINTING	
ART 2544 CERAMICS I	
ART 2554 INTRODUCTION TO SCULPTURE	
ART 2564 INTRO PHOTOGRAPHY	
ART 2644 CERAMICS II	
ART 2664 DIGITAL PHOTOGRAPHY	ART 3004 TOPICS IN ART HISTORY
ART 2704 3D COMPUTER ANIMATION	ART 3064 ARTS OF CHINA AND JAPAN
ART 3514 TOPICS IN DRAWING	ART 3074 EGYPTIAN ART & ARCHITECTURE
ART 3524 TOPICS IN PAINTING MEDIA	ART 3084 GREEK ART & ARCHITECTURE
ART 3544 TOPICS IN CERAMICS	ART 3174 TOPICS IN ARCHAEOLOGY
ART 3554 TOPICS IN SCULPTURE	ART 3184 ROMAN ART & ARCHITECTURE
ART 3564 TOPICS IN DIGITAL PHOTOGRAPHY	ART 3284 MEDIEVAL ART & ARCHITECTURE
ART 3604 TOPICS IN NEW MEDIA ART	ART 3384 RENAISSANCE ART & ARCHITECTURE
ART 3704 TOPICS IN COMPUTER ANIMATION	ART 3484 BAROQUE & ROCOCO ART & ARCHITECTURE
ART 4504 MULTIMEDIA STUDIO	ART 3584 19TH-CENTURY ART
ART 4514 INTERARTS STUDIO	ART 3774 HISTORY OF MODERN GRAPHIC DESIGN
ART 4524 PICTORIAL ARTS STUDIO	ART 3684 AFRICAN-AMERICAN ART
ART 4534 APPLIED ART & DESIGN STUDIO	
ART 4544 COMPUTER ANIMATION STUDIO	
ART 4554 SPATIAL ARTS STUDIO	
ART 4564 EXHIBITION DESIGN & DISPLAY	
ART 4804 NEW MEDIA THEORY	
ART 4854 STUDIO ART THEORY	

Bachelor of Fine Arts in Visual Communication Design

The Visual Communication Design program is notable for its practical and applied approach to design pedagogy. Majors in Visual Communication Design develop conceptual abilities, problem solving skills and technical know-how required by a fast-paced, competitive field. Visual Communication Design demands individual creativity, teamwork skills, and adaptability to changing markets and technologies. The Visual Communication Design program at Virginia Tech prepares students for the job market with practical experience and a full, professional portfolio. Graduates of the program may find themselves working in print design, product and packaging design, multimedia web page design, and advertising design. We have also added a program teaching 3D Animation and Interactive Design.

Visual Communication Design offers a Bachelor of Fine Arts degree (BFA). Visual Communication Design is a restricted program requiring a special application, portfolio review and completion of specific art prerequisites. Students do not enter the Visual Communication Design Program as incoming freshmen, but only after completing a basic sequence of required freshman prerequisite Art Foundations courses. Complete information about the Visual Communication Design Portfolio Review is available on the School's website (http://www.sova.vt.edu).

Students who have been accepted into the Visual Communication Design Program begin the Visual Communication Design course sequence in the second year. From that point on, the course sequences for Studio Art and Visual Communication Design are uniquely tailored to each area.

Total 120 Credit Hours required for Graduation.

First Year:	
ART 1504 Foundations of Art and Design	3
ART 1514 Basic Drawing	3
ART 2504 Digital Art	3
ART 2514 Life Drawing	3
Portfolio Review generally occurs in the late Fall of the first year.	
Second Year:	
ART 2575 Intro to VCD	3
ART 2576 Intro to VCD	3
ART 2524 Introduction to Painting	3
ART 2544 Introduction to Ceramics	3
ART 2554 Introduction to Sculpture	3
ART 2385-2386 Survey of Art History	6
ART 2384 Survey Discussion, Writing Intensive (repeated course, 1 credits each)	2
Third Year:	
ART 3565 Intermediate I in Graphic Design	3
ART 3566 Intermediate II in Graphic Design	3
ART 3784 20th Century Art (Fall only)	3
ART Studio Topics courses, 3000 level	6
ART History Electives, 3000/4000 level	3
Fourth Year:	
ART 4504 Multimedia	3
ART 4574 Advanced Visual Communications	3
ART 4964 Graphic Design Internship	3
ART 4000 Studio Topics Course	3
ART History Electives, 3000/4000 level	3
ART Electives	9
Total number of ART credits: 78	
Total credits for Curriculum for Liberal Education: 32-38	
Total free elective credits: 4-10	
Total credits required for the degree: 120	

Satisfactory Progress Towards Degree

Students must successfully pass portfolio review in either Studio Art or Graphic Design to take any course higher than ART 1604. In addition to the University requirement for satisfactory progress (see Satisfactory Progress in Academics Chapter), upon completion of 72 semester credits, students must have completed all second year in-major courses with a C or higher. They must maintain an in-major GPA of at least 2.0 within the Department of Art and Art History. Students below this requirement will be notified by the Program Chair of their academic status within the program.

Curriculum for Liberal Education Requirements

Requirements and options may change. Consult the Undergraduate Catalog and the Provost's web site for courses.
Select from the approved Curriculum for Liberal Education Courses:

Area 1. Writing and Discourse: Selected from first-year writing courses. Students must complete two Writing Intensive courses.	6
Area 2. Ideas, Cultural Traditions, and Values	6
Area 3. Society and Human Behavior	6
Area 4. Scientific Reasoning and Discovery	6
Area 5. Quantitative and Symbolic Reasoning	6
Area 6. Creativity and Aesthetic Experience This 1 credit hour requirement for area 6 is met by in-major of (SOVA)	1
Area 7. Critical Issues in a Global Context	3

Foreign Language Requirement College Level
Two years of foreign language or equivalent from high school will substitute.

TOP

Financial Assistance

Scholarship support is available and scholarship awards are decided in the spring for the following year. All prospective freshmen who apply to the major and all upper-level students who apply for scholarships are eligible.

Minors

A minor in Art History is available and requires completion of 18 semester hours. Checklists of specific requirements are available from the School.

For students graduating in Calendar year 2011 and after:

18 Total Credit Hours for minor	
ART 2385[1] Survey of the History of Western Art I	3
ART 2386[2] Survey of the History of Western Art II	3
ART 3XXX 3000-level Art History Courses	6
ART 4XXX 4000-level Art History Courses	6

[1]ART 2385 is offered Fall Semester only
[2]ART 2386 is offered Spring Semester only

Curriculum for Liberal Education

Majors in all Art degree programs must satisfy in full the requirements of the Curriculum for Liberal Education. The School has other specific requirements for completing the Liberal Education curriculum.

Undergraduate Courses (ART)

Foundations of Art

1204: PRINCIPLES OF ART & DESIGN I
Introduction of two-dimensional principles of design through employment of traditional and digital media. Reference to historical and theoretical context strengthens proficiency in the language of design. Application of contemporary practices and ethics. Projects, applied problem solving, reading assignments and critiques supply graphic skills and specialized vocabulary. RESOURCE CHARGE. (1H,5L,3C)

1214: PRINCIPLES OF ART & DESIGN II
Introduction of two-dimensional principles of design through employment of traditional and digital media. Reference to historical and theoretical context strengthens proficiency in the language of design. Application of contemporary practices and ethics. Projects, applied problem solving, reading assignments and critiques supply graphic skills and specialized vocabulary. RESOURCE CHARGE. Pre: 1204 or 1504. (1H,5L,3C)

1404: DRAWING I
Methods and concepts fundamental to drawing, for the beginning student. No previous experience necessary. Emphasis on controlled use of common drawing media for representational and expressive purposes. RESOURCE CHARGE. (1H,5L,3C)

1414: DRAWING II: LIFE DRAWING
Drawing the human figure from life. Emphasis on observation, construction, and anatomy. RESOURCE CHARGE. Pre: 1404 or 1514. (1H,5L,3C)

1504: FOUNDATIONS OF ART AND DESIGN
An introduction to the fundamentals of studio practice in the visual arts. Projects, problem-solving through study and application of the basic principles of art and design. Two- and three-dimensional composition, and introductory drawing are stressed. A prerequisite required for all art majors and minors before entry into upper-level courses of studio art. FEES REQUIRED. (1H,5L,3C)

1604: PRINCIPLES OF NEW MEDIA ART & DESIGN
Introduces the student to the concept of new media through the research and development of contemporary art and design. The creative and aesthetic potential of the computer will be explored to produce new media product. RESOURCE CHARGE. (1H,5L,3C)

2384: SURVEY DISCUSSION SECTION
Discussion in greater depth and additional writing on material presented in the 2385, 2386 lectures. May repeat for maximum of 2H, 2C. Required for Art Majors. Co: 2386, 2385. (1H,1C) I,II.

Studio Art and Visual Communications Design

2524: INTRODUCTION TO PAINTING
Students will explore painting practices and their relationship to art and design in contemporary culture, and develop basic painting skills and an understanding of various painting media. Encompasses illustrational technique and practical applications, expressive and abstract approaches to painting. Resource charge. Pre: (1214, 1414, 1604) or 1504. (1H,5L,3C)

2544: CERAMICS I
Basic investigations into the materials, techniques, history and appreciation of the ceramic arts. Ceramic processes and technology including hand forming construction methods, glazing, and kiln firing. Design concepts as they relate to clay objects are stressed. Historic and contemporary ceramics objects along with methods and traditions of cultures from around the world will be introduced through a range of media. RESOURCE CHARGE. Pre: (1414, 1214, 1604) or 1504. (1H,5L,3C)

2554: INTRODUCTION TO SCULPTURE
An introduction to sculptural processes and materials in art and design. Intensive studio work on individual projects. Review of historical and contemporary issues as applied to the definition of space, texture, mass, volume, scale and other principles of three-dimensional art. Resource charge. Pre: (1214, 1414, 1604) or 1504. (1H,5L,3C)

2564: INTRODUCTION TO PHOTOGRAPHY
An introduction to photography, consisting of instruction in both black and white darkroom and color digital photographic techniques. Student will learn fundamentals of operating a 35mm camera; developing, exposing and printing black and white negatives; as well as aesthetic concepts of composition and design. Student will also explore the aesthetics of composition in color, using a digital camera, and manipulating the images on a computer. FEES REQUIRED. Pre: 1214, 1414, 1604. (1H,5L,3C)

2575-2576: INTRODUCTION TO GRAPHIC DESIGN
Introduction to the theory and practice of graphic design as a means of visual communication, exploring problem-solving as applied to design concepts and execution. Studio assignments relating to society, industry, community, and commerce, with emphasis on digital/electronic applications. Resource charge. Pre: 1604 or 2504 for 2575; 2575 for 2576. (1H,5L,3C)

2644: CERAMICS II
Introduction to forming methods using the potter's wheel. Design concepts, techniques and approaches to creating functional forms. Overview of contemporary and historic utilitarian ceramics. RESOURCE CHARGE. Pre: 2544. (1H,5L,3C)

2664: DIGITAL PHOTOGRAPHY
Concepts, terminology, and skills in digital photography. Discover and utilize the appropriate techniques for camera control, exposing techniques, image manipulation and approaches to output options. RESOURCE CHARGE. Each student MUST own a digital SLR camera. Email jrosenth@vt.edu to inquire. Pre: 1604. (1H,5L,3C)

2704: 3D COMPUTER ANIMATION
Introduction to the basic principles of 3d-computer animation including modeling, texture mapping, lighting, and motion. RESOURCE CHARGE. Pre: (1214, 1414, 1604) or (1504, 2504). (1H,5L,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3504: TOPICS IN DIGITAL ART AND DESIGN
Rotating topics that explore the computer as an artistic medium and design tool. Intermediate level. The student will encounter as interdisciplinary approach to the use of the computer, as aesthetic ideas are presented and various digital techniques are applied. Stresses use and manipulation of original images created by the student, employing a combination of digital and traditional methods. May be repeated for a maximum of 9 hours with

different topics. Pre: 2504 or 1604. (1H,5L,3C)

3514: TOPICS IN DRAWING
Rotating topics in drawing media, approaches, and theories. All topics will be devoted to promoting individual student creativity, mastery of drawing means and techniques, and further understanding of graphic concerns. FEES MAY BE REQUIRED. May be repeated for a maximum of 9 hours with different topics. Pre: (1214, 1414, 1604) or (1514, 2514). (1H,5L,3C)

3524: TOPICS IN PAINTING MEDIA
Rotating topics in painting techniques, disciplines, and theory emphasizing individual creative development and skilled approaches to technical problem-solving in visual art and design. Intermediate level. FEES MAY BE REQUIRED. May be repeated for a maximum of 9 credits with different topics. Pre: 2524. (1H,5L,3C)

3544: TOPICS IN CERAMICS
Rotating Topics in special techniques, processes, design concepts and forms in the ceramic arts. May be repeated for a maximum of 9 hours with different topics. Resource Charge. Pre: 2644. (1H,5L,3C)

3554: TOPICS IN SCULPTURE
Rotating topics that will focus on specific technical processes and applications of three dimensional problem solving in the visual arts. The course will stress techniques and issues found in contemporary 3D art and design. Emphasizes intensive studio practice through a series of individual projects related to the topics. Resource Charge. May be repeated for a maximum of 9 credits with different topics. Pre: 2554. (1H,5L,3C)

3564: TOPICS IN PHOTOGRAPHY
Rotating topics in photographic materials, methods and philosophies. All topics promote individual student's creativity, master of photographic techniques and further understanding of the medium. RESOURCE CHARGE. May be repeated with different topics for a maximum of 9 credits. (1H,5L,3C)

3565-3566: INTERMEDIATE GRAPHIC DESIGN I AND II
Intermediate design layout, technical and concept development, and communication skills. First semester emphasizes advanced and new software relevant to the design, advertising, and printing industry. Second semester focuses on typography, professional pre-press, electronic printing and color separation processes. FEE REQUIRED. Pre: 2576 for 3565; 3565 for 3566. (1H,5L,3C)

3574: TOPICS IN GRAPHIC DESIGN
Rotating topics in graphic design, for the intermediate level student. This course will encourage visual problem-solving, conceptual development, clarity and individuality of expression. May be repeated for a maximum of 9 credits with different topics. Pre: 2576. (1H,5L,3C)

3704: TOPICS IN COMPUTER ANIMATION
Rotating topics that explore computer animation as an artistic medium and design tool. Intermediate level. The student will encounter an interdisciplinary approach to the use of computer animation, as aesthetic ideas are presented and various digital techniques are applied. Stresses use and manipulation of virtual character designs created by the student. May be repeated for a maximum of 9 credit hours. Pre: 2704. (1H,5L,3C)

3854: PROFESSIONAL STUDIO PRACTICES
An overview of professional studio art practices, concepts, marketing strategies and promotional materials. The international exhibition system and current educational opportunities, employment and career options in the visual arts are presented. Preparing of written materials and documenting artwork, building a professional portfolio for presentation to potential employers, art galleries and exhibitions are stressed. Pre: Bachelors of Fine Arts (BFA) majors only. "ViEWS" appropriate. (3H,3C)

3984: SPECIAL STUDY
Variable credit course.

4504: TOPICS IN MULTIMEDIA STUDIO
This studio course investigates computer-based multimedia in the visual arts and applied design. Video, photography, computer art and design may be used with traditional media and communication vehicles. May be repeated for a maximum of 6 credits. Two 3000-level courses required. Pre: (1214, 1414, 1604) or (1504, 1514, 2504). (1H,5L,3C)

4514: INTERARTS STUDIO
This studio course will investigate new approaches to art-making and new genres, such as performance art and site-specific installation. Interdisciplinary basis for course may incorporate traditional studio practices and media in the visual arts, music and theatre arts, and appropriate technology in computer, video, and film. May be repeated for a maximum of 6 credits with different topics. 3000-level Studio or Art History course required. RESOURCE CHARGE (1H,5L,3C)

4524: PICTORIAL ARTS STUDIO
Rotating topics in the two dimensional arts, at an advanced level. All topics will challenge the student to develop stronger, independently generated work of portfolio quality. May be repeated for a maximum of 6 credits with different topics. 3000-level Painting or Drawing course required. RESOURCE CHARGE Pre: 3524 or 3514. (1H,5L,3C)

4534: TOPICS IN APPLIED ART AND DESIGN STUDIO
Rotating topics about functional art and design. Students will use appropriate materials, tools, and processes in the creation of functional artworks, such as furniture, tiles, tableware, etc. Function and design aesthetics emphasized. May be repeated for a maximum of 6 credits with different topics. RESOURCE CHARGE (1H,5L,3C)

4544: COMPUTER ANIMATION STUDIO

Advanced animation course focusing on the creation of short films, demo reels, and expressive computer animated films. Students enrolled in this course are expected to complete one large project during the semester. Pre: 3704 or 3704. (1H,5L,3C)

4554: SPATIAL ARTS STUDIO
Advanced level, rotating topics in the three dimensional arts. All topics will challenge the student to develop stronger, independently generated work of portfolio quality. May be repeated for a maximum of 6 credits with different topics. 3000-level Ceramics, Sculpture or Applied Art course required. RESOURCE CHARGE Pre: 2554. (1H,5L,3C)

4564: EXHIBITION DESIGN AND DISPLAY
This course will focus on the display and presentation of visual art, using local galleries as venues for student- designed exhibitions. Provides experience in the public art arena, and practical knowledge about planning, designing, and mounting an exhibition. 3000-level Studio or Art History course required. (1H,5L,3C)

4574: ADVANCED VISUAL COMMUNICATIONS
A further refinement of design theory and practice, and communication skills. Emphasis on the conceptual development of expanded project formats, and individual creativity. This class will provide a principal opportunity for building a viable portfolio. RESOURCE CHARGE 6 credits of Art 3574 required. Pre: 4504. (1H,5L,3C)

4804: NEW MEDIA ART THEORY
Exploration of new media theory in relationship to contemporary arts practice. Overview and application of new media art aesthetics, strategies, trends, and socio-cultural aspirations. The course will examine theoretical writings and creative work from prevailing technologically-based disciplines. Must have Art 3604 prerequisite or permission of the instructor. Pre: 2385, 2386. (3H,3C)

4854: THEORIES AND PROCESSES OF CONTEMPORARY ART
Analysis of contemporary art, art theory and criticism. Theoretical development through independent projects, critical essays, written analysis, oral critiques and class discussions. Application of conceptual concerns in advanced studio processes. RESOURCE CHARGE. Pre: 3854, 3784 or permission of the instructor. Pre: 2385, 2386. (3H,3C)

4894: SENIOR STUDIO
Preparation and presentation of concentrated studio work under faculty supervision, culminating in solo exhibition and/or formal portfolio. May be extended over two semesters with final grade assigned on completion. Or may be repeated for a total of 6 credits at a maximum of 3H, 3C per semester. Senior standing and consent of department head required. Variable credit course. I,II,III.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

Art History

2385,2386: SURVEY OF THE HISTORY OF WESTERN ART
Survey of art and architecture of Western Europe. 2385: emphasis on Greek, Roman, and medieval 2386: from ca. 1300 to the contemporary period; works of major masters such as Giotto, Leonardo, Michelangelo, Rembrandt, as well as works of European and American Impressionism, Expressionism, and Modernism. (3H,3C) 2385: I,III,IV; 2386:

3004: TOPICS IN ART HISTORY
Rotating topics from all periods of art history with a particular emphasis on non-Western art, such as Japanese, Chinese, pre-Columbian, sub-Saharan, Native American, or Islamic art and architecture. Lecture and/or undergraduate seminar format. May be repeated for credit with different content for a maximum of 9 credits. Pre: 2385 or 2386. (3H,3C) I,II.

3064: THE ARTS OF CHINA AND JAPAN
An introduction to Chinese and Japanese art from the Neolithic to the present. The influence of philosophy, religion and social organizations on the development of the visual arts in China and Japan. Considerations of a range of media including painting, architecture, calligraphy, ceramics, prints and lacquer. (3H,3C)

3074: EGYPTIAN ART AND ARCHITECTURE
Introduction to Egyptian art and architecture from the Predynastic through the Late Period with emphasis on the major monuments of Egyptian sculpture, painting and architecture and the history of archaeological exploration within Egypt of the Old and New Kingdoms. Pre: 2385. (3H,3C)

3084: GREEK ART AND ARCHITECTURE
Painting, sculpture, and architecture of the Greeks, ca. 1000-31 B.C. Emphasis on correlation of archaeological remains with literary sources, and on the development of the arts in relation to cultural environments of the archaic, classical, and Hellenistic periods. Pre: 2385. (3H,3C) I,II.

3174: TOPICS IN ARCHAEOLOGY
Explores human fascination with, and responsibility to, the physical monuments of the past through a history of the discipline of archaeology in the

Mediterranean world. Examines contemporary global issues surrounding the preservation and protection of archaeological artifacts, particularly with regards to the role they serve as objects of cultural heritage and cultural identity. Pre: 2385. (3H,3C)

3184: ROMAN ART AND ARCHITECTURE
Painting, sculpture, and architecture of the Romans 500 B.C. - 323 A.D. Emphasis on relation between monuments and the political and cultural circumstances that led to their creation. Pre: 2385. (3H,3C) I,II.

3284: MEDIEVAL ART AND ARCHITECTURE
The painting, sculpture, and architecture of the 4th through the 14th centuries in the Latin West, with an emphasis on the Romanesque and Gothic Periods. Pre: 2385. (3H,3C) I,II.

3384: RENAISSANCE ART AND ARCHITECTURE
A chronological survey of Renaissance art from the Limbourg Brothers through Mannerism, with an emphasis on painting and architecture. Major stylistic trends are discussed in the historical contexts of artistic techniques, patronage, iconography and the primary literature of the period. Pre: 2386. (3H,3C)

3484: BAROQUE AND ROCOCO ART AND ARCHITECTURE
Seventeenth-Century Baroque and Eighteenth-Century Rococo Art of Europe, with an emphasis on painting, sculpture, and architecture. Major artistic trends in Italy, Spain, Flanders, Holland, and France are discussed in their historical, cultural, and social context. Pre: 2386. (3H,3C)

3584: NINETEENTH-CENTURY ART: NEO-CLASSICISM TO POST-IMPRESSIONISM
European art of the nineteenth-century. A chronological study of neoclassicism, romanticism, realism, impressionism, symbolism and post-impressionism. Pre: 2386. (3H,3C) I,II.

3684: SURVEY OF AFRICAN-AMERICAN ART
A chronological survey of African-American art, from its beginnings in the tribal traditions of Africa to its contemporary manifestations. Pre: 2386 or AFST 2774. (3H,3C)

3774: HISTORY OF MODERN GRAPHIC DESIGN
A chronological survey of the history of modern graphic design, from the mid-19th century to 1980. Pre: 2386. (3H,3C)

3784: EUROPEAN AND AMERICAN ART SINCE 1900
European and American Art since 1900. A chronological survey of painting and sculpture from neo-impressionism through post-modernism. Pre: 2386. (3H,3C)

3884: AMERICAN ART TO 1914
American art from its colonial beginnings until World War I. I Pre: 2386. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4384: TOPICS IN ART HISTORY
Advanced art history elective. Rotating topics from all periods of art history, selected to complement offerings at the 3000-level. Topics such as Greek Sculpture, Roman Painting, Renaissance and Baroque Sculpture, Cubism, and Fauvism indicated by timetable. Lecture and/or undergraduate seminar format. May be repeated for credit for a maximum of 18 credits. Pre: 2385 or 2386. (3H,3C)

4484: TOPICS IN ART CRITICISM AND METHODOLOGY
Advanced art history elective. Rotating topics in the criticism of art and the methodology of art history and criticism, selected to complement offerings at the 3000-level. Topics such as the History of Art Criticism from Baudelaire to the Present, New Methods in Renaissance and Baroque Art History, and the Theory of Art from various periods, indicated by timetable. Lecture and/or undergraduate seminar format. May be repeated for credit with different content to a maximum of 9 credits. Pre: 2385 or 2386. (3H,3C)

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Architecture & Urban Studies

Building Construction

http://www.bc.vt.edu

University Exemplary Department
Walid Thabet, Department Head
Georgia Anne Snyder-Falkinham Professor of Building Construction: Y.J. Beliveau
William E. Jamerson Professor: M. J. O'Brien
Associate Professors: T. H. Mills; W.Y. Thabet
Assistant Professors: K. Ku; A.P. McCoy; A.R. Pearce; G. Reichard

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Overview

The Department of Building Construction's mission is to build leaders for the construction industry and society. This is accomplished by providing undergraduate students with a complete and diversified grasp of the building industry through technical and managerial courses and a Curriculum for Liberal Education that emphasizes self-motivation, imagination and social responsibility. The program offers a unique opportunity in education for those interested in a future in the construction/development industry.

The Building Construction program develops within the student a solid foundation in construction knowledge.

The first two years of the program are identical and form the core basics for proceeding into one of two options: the Construction and Design (CD) option or the Development, Real Estate, and Construction (DREC) option.

The course work for both options includes structural, mechanical, and electrical systems, and related subjects. Management subjects such as construction financing, contracts, planning, scheduling, and construction means and methods help familiarize the student with concepts and skills essential in the building industry. Construction materials, equipment, and procedures are also studied in the classroom and reinforced by visits to on-going construction sites. Students also gain an understanding of construction drawings and specifications, and their importance to the successful execution of building contracts and projects.

The business and construction management sequences, for all students, are devoted to necessary decision-making skills. Management topics include: organizational, financial, and legal structures for the business and project; estimating and bidding strategies; contracts; and planning and scheduling techniques. The "case study method" is used at various times in order to develop the student's ability to define problems, identify choices, and recognize the most critical elements in a variety of situations

The Construction and Design option has an added focus of exploring technical and engineering issues supporting construction design and operations. The Development, Real Estate, and Construction option has its focus in the real estate and development arena. Entry into the Development, Real Estate, and Construction option is limited to students who are admitted to the Real Estate Minor in the Pamplin College of Business. The choice of which option to pursue is made in the spring semester of the second year.

The Building Construction major is accredited by the American Council for Construction Education. Upon successful completion of the four-year program of 134 credit hours of study, a Bachelor of Science in Building Construction is awarded.

Effective: Graduating class of 2010:

Building Construction Foundation (first two years)

FIRST YEAR (31 semester credits)	
First Semester	Credits
BC 1214: Intro. to Building Construction	3
ENGL 1105: Freshman English (Area 1) **	3
ACIS 2004: Survey of Accounting	3

MATH 1114: Elementary Linear Algebra	2
MATH 1205: Calculus (Area 5) **	3
Area requirement (Area 6) **	1
	15
Second Semester	
BC 1224: Intro. to Building Construction & Lab	3
BC 2114: Information Technology in Design & Construction	2
ENGL 1106: Freshman English (Area 1) **	3
MATH 1206: Calculus (Area 5) **	3
MATH 1224: Vector Geometry	2
ECON 2005: Principles of Economics (Area 3) **	3
	16
SECOND YEAR (36 semester credits)	
First Semester	
BC 2014: Construction Principles I	3
CEE 2814: Measurements	4
ESM 2104: Statics	3
MATH 2224: Multivariable Calculus	3
PHYS 2305: Foundations of Physics I + Lab (Area 4) **	4
	17
Second Semester	
BC 2024: Construction Principles II	3
BC 2064: Construction Principles Lab	1
BC 2044 Building and Materials + Lab	3
ESM 2204: Mechanics of Deformable Bodies	3
ECON 2006: Principles of Economics (Area 3) **	3
PHYS 2306: Foundations of Physics I + Lab (Area 4) **	4
	17

Construction and Design Option

THIRD YEAR (32 semester credits)	
First Semester	
BC 4004: Building Systems Technology I	4
BC 3115: Building Cultures (Area 2) **	3
ENGL 3764: Technical Writing (WI)	3
CEE 3404: Theory of Structures	3
GEOS 2104: Elements of Geology + Lab	3
ISE 2014: Engineering Economy	2
	18
Second Semester	
BC 4014: Building Systems Technology II	3
BC 3064: Building Systems Technology Lab	1
BC 3116: Building Cultures (Area 2) **	3
CEE 3424: Reinforced Concrete Structures I	3
CEE 3434: Design of Steel Structures I	3
FIN 3055: Legal Environment of Business	3
	16
FOURTH YEAR (35 semester credits)	
First Semester	

BC 4434: Construction Practice I (WI)	3
BC 4164: Process Planning & Design	3
CEE 3514: Intro. to Geo-technical Engineering	3
COMM 2004: Public Speaking	3
Elective (BC Directed Elective)	3
Elective (Business + Management)	3
	18
Second Semester	
BC 4444: Construction Practice II	4
BC 4064: Construction Practice (Capstone) Lab	1
Elective (BC Directed Elective)	3
Elective (Business + Management)	3
Elective (Business + Management)	3
Area requirement (Area 7) **	3
	17

Development, Real Estate, and Construction Option

THIRD YEAR (33 semester credits)	
First Semester	
BC 4004: Building Systems Technology I	4
BC 3115: Building Cultures (Area 2) **	3
ENGL 3764: Technical Writing (WI)	3
AAEC 4754: Real Estate Law	3
GEOS 2104: Elements of Geology + Lab	3
ISE 2014: Engineering Economy	2
	18
Second Semester	
BC 4014: Building Systems Technology II	3
BC 3064: Building Systems Technology Lab	1
BC 3124: Housing and Land Development	3
BC 3116: Building Cultures (Area 2) **	3
FIN 3055: Legal Environment of Business	3
UAP 4744: Principles of Real Estate	4
	17
FOURTH YEAR (34 semester credits)	
First Semester	
BC 4434: Construction Practice I (WI)	3
BC 4164: Process Planning & Design	3
CEE 3514: Intro. to Geo-technical Engineering	3
COMM 2004: Public Speaking	3
Elective (BC Directed Elective)	3
Elective	2
	17
Second Semester	
BC 4444: Construction Practice II	4
BC 4064: Construction Practice (Capstone) Lab	1
AAEC 4764: Real Estate Appraisal	3
MKTG 4734: Real Estate Marketing	3
Elective (BC Directed Elective)	3

Area Requirement (Area 7) **	3
	17

**Satisfies Curriculum for Liberal Education requirement

Minor in Building Construction

Students from related professional concentration departments may pursue a minor in Building Construction. The concentration requires the completion of 18 credits as follows:

		Credits
BC 1214	Intro to Building Construction	3
or		
CEE 3014	Construction Management	
BC 2014	Construction Principles - I	3
BC 2024	Construction Principles - II	3
BC 2064	Construction Principles Lab	1
BC 4434	Construction Practice - I	3
BC 4444	Construction Practice - II	4
BC 4064	Construction Practice Lab	1

Students who wish further information or advice about minoring in Building Construction should consult a faculty member in the Department of Building Construction.

Undergraduate Courses (BC)

1214: INTRODUCTION TO BUILDING CONSTRUCTION I
This is an introduction to the world of construction with an overview of the important areas of contracting and the inter-workings of the construction industry. Emphasis is placed on the theory and terminology of the construction industry supplemented with the graphical representation of construction documents and laboratory building experiments. (2H,3L,3C)

1224: INTRODUCTION TO BUILDING CONSTRUCTION II
Continuation of introduction to the world of construction with an overview of the important areas of contracting and the workings of the construction industry. Emphasis is placed on the application of theory, processes and vocabulary of the construction industry supplemented with computer aided graphical representation of construction documents. Pre: 1214. (2H,3L,3C) II.

2014: CONSTRUCTION PRINCIPLES I
This course covers the fundamentals of construction technology and processes emphasizing materials, methods, techniques and sequences for the construction of buildings (CSI Divisions 1-6). Planning, scheduling and quantity surveying for the management of construction resources are among the topics studied. I Pre: MATH 1205 or MATH 1205H. (2H,3L,3C)

2024: CONSTRUCTION PRINCIPLES II
This is a continuation of the fundamentals of construction technology and processes emphasizing materials, methods, techniques and sequences for the construction of buildings in CSI divisions 7-16. Planning, scheduling, quantity surveying and control systems for the management of these construction resources are among the topics studied. Pre: 1224, 1214, 2014. Co: 2064. (3H,3C) II.

2044: BUILDINGS & MATERIALS
Introduction to the theory and applications of building materials. Properties, composition, and characteristics of building materials with particular focus on ferrous and non ferrous metals, concrete, bricks and blocks, timber, glass and plastics. Emphasis on physical behavior of materials under load, including thermal loads, compatibility deformations and material behavior requirements, interaction among different materials, non- destructive/destructive methods for evaluation and testing of construction materials, basic analysis and design applications of major structural components. Pre: ESM 2104. Co: ESM 2204. (2H,3L,3C)

2064: CONSTRUCTION PRINCIPLES INTEGRATED LAB
Develop a competency in applying construction means and methods as they relate to quantity take-off, cost management, scheduling and resource management in support of a senior capstone project. Pre: 1214, 1224, 2014. Co: 2024. (1H,2L,2C)

2114: INFORMATION TECHNOLOGY IN DESIGN AND CONSTRUCTION
A web based computer applications laboratory course related to the introduction, application and utilization of basic informational technologies used in the design and construction profession. Production and project management improvements through the use of computer applications are explored, including Internet based project management, and CADD design and database integration, spreadsheet applications, computer programming, and computer based project management software. Co: 1214. (1H,3L,2C) I,II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3064: BUILDING SYSTEMS TECHNOLOGY LAB
Develop a competency in the application of Building Environmental Systems, through modeling, scheduling, estimating, and experiments in support of a senior capstone project. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 4014, CEE 3014, CEE 4074. (1H,2L,2C)

3115,3116: BUILDING CULTURE, A HISTORY OF CONSTRUCTION
Comprehensive review of construction and the social, ethical, political, economic and technological forces that drive the development of shelter, building, sanitation, and transportation infrastructure from Neolithic times to the present focused on Europe and America, with significant case examples from Asia and Africa. 3115 will cover shelter to the ideal city during the renaissance. 3116 will focus on the modern condition from the renaissance forward. (3H,3C)

3124: HOUSING AND LAND DEVELOPMENT
A comparison of the problems and strategies of delivering single and multi-family housing in urban and suburban contexts. The interdependency of subdivision and zoning ordinances, utility infra-structure, environmental impact, economic feasibility, purchasing versus rental programs, and availability of housing systems are concerns examined. Junior standing required. Pre: 2024, 2064. (3H,3C)

4004: BUILDING SYSTEMS TECHNOLOGY I
The student is exposed to the theory and analysis methods relative to the design and integration of Mechanical and Electrical Building Systems. Topics covered include: conceptual design, technical operations and maintenance issues necessary for determining the selection of passive and active environmental control systems within a building including: Heating, Ventilation, Air Conditioning, Lighting, Acoustical and Plumbing. I Pre: 2024, 2064, 2114. Co: PHYS 2306. (3H,2L,4C)

4014: BUILDING SYSTEMS TECHNOLOGY II
This course places an emphasis on the physical installation and integration of passive and active environmental control systems including: heating, ventilation, air conditioning, lighting, acoustics and plumbing. Lectures by faculty and seminars by construction industry practitioners address issues that are relevant to illustrating the applications resulting from theory studied in BC 4004. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 3064, CEE 3014, CEE 4074. (2H,3L,3C)

4024 (CEE 4014): ESTIMATING, PRODUCTION, AND COST ENGINEERING
Interpretation of plans and specifications, preparation of construction estimates, and cost control. Methods analysis, resource requirements, and resource costs in building systems, including system components, and in large-scale civil engineering works such as highways, bridges, and hydraulic structures. Pre: 2024, 2064. (3H,3C) I,II.

4034 (CEE 4034): CONTRACT SPECIFICATIONS
The course work provides an overview of the basics of the Project Manual (a collection of the contractual provisions of a nontechnical nature together with the technical provisions). Techniques of specification writing, interpretation of intent, and complimentary documents are studied. Senior standing required. (3H,3C)

4054 (CEE 4054): CONSTRUCTION LAW: ROLES AND RESPONSIBILITIES
A study of current legal problems associated with the construction industry. Traditional roles of the various industry participants are examined from a management's perspective. The entire building process, from pre-design to owner use, is covered with emphasis on claims avoidance. Pre: 4434 or CEE 3014 or ARCH 4044. (3H,3C)

4064: CONSTRUCTION PRACTICE LAB
Application of the business and construction practices related to operation of a construction company to the execution of a senior capstone project. All project management concepts learned in prior courses are applied in the capstone lab experience. Written and oral work is formally presented and critiqued among construction faculty, students, and industry professionals. Pre: 4434. Co: 4444.
(1H,2L,2C)

4164: PRODUCTION PLANNING AND PROCESS DESIGN FOR CONSTRUCTION
The course deals with the planning and design of construction processes. Course topics include production systems, behavior of construction systems and workers, the relationships between subsystems in the construction process, queuing systems, process modeling and simulation. The major emphasis is on production and productivity. Production problems that typically occur in construction systems are discussed. The course also explores recent innovations in construction system design such as lean construction and agile construction. Pre: 4004, 4014, 3064. (3H,3C)

4434: CONSTRUCTION PRACTICE I
Business and construction practices related to operation of a construction company are studied. Construction law is examined as it relates construction, financial and personnel management. Project management topics studied in this course include permitting, site evaluations, design development and design phase considerations such as preliminary estimates and project constructability. Writing Intensive (WI) course. I Pre: (4014, 3064), (2044 or CEE 3014, CEE 4074). (3H,3C)

4444: CONSTRUCTION PRACTICE II
This course explores and applies the business and construction practices related to operation of a construction company to a capstone experience. Construction law is examined as it relates to construction, financial and personnel management. Project management topics studied in this course are applied in the corequisite lab. This course is formally designated as a writing intensive course. Formal written and edited and oral presentations are presented and critiqued by the BC faculty team, the writing resource center, students and industry professionals. Pre: 4434. Co: 4064. (3H,3L,4C) II.

4754: INTERNSHIP
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

College of Architecture and Urban Studies Programs of Study
Art and Art History | Architecture | Building Construction | Industrial Design | Interior Design
Landscape Architecture | School of Public and International Affairs

College of Architecture and Urban Studies and College of Engineering

Myers-Lawson School of Construction

www.mlsoc.vt.edu

Director: Yvan Beliveau
Associate Director: Michael Garvin
Assistant Director of Undergraduate Studies and Outreach: Christine Fiori
Primary Faculty: C. Fiori; M. Garvin; D. Young
Core Faculty:
Dept. of Building Construction: Y. Beliveau; K. Ku; T. Mills; A. Pearce; G. Reichard; W. Thabet
Vecellio Construction Engineering & Management Program in the Dept. of Civil & Env. Engineering: J. de la Garza; S. Sinha; M. Vorster
Industrial & Systems Engineering: B. Kleiner

Construction Engineering and Management Program

Overview

The Myers-Lawson School of Construction offers students in the College of Engineering a Bachelor of Science Degree in Construction Engineering and Management. This degree is designed for students who wish to pursue a career in the construction industry. The undergraduate program facilitates the development of critical technical, managerial and professional knowledge and skills required for entry into the construction industry or graduate studies. This body of knowledge includes the decision and optimization methods required to integrate and manage the resources essential to construction operations along with the skills that support the development of safe, ethical, socially responsible, and sustainable solutions for the built environment.

Construction managers plan, direct, and coordinate construction projects, including the building of all types of residential, commercial, and industrial structures, roads, bridges, and other public works projects. Construction managers coordinate and supervise the construction process from the conceptual development stage through final construction, ensuring the project is completed within time and budget constraints and is compliant with building and safety codes and other regulations.

The focus of this degree is construction management with engineering and business management as additional major areas of study. The degree retains an emphasis on engineering, with a focus on construction theory and applications, while providing students the opportunity to define the areas of business management they wish to study to complement their career goals.

Coursework capitalizes upon established excellence in the Via Department of Civil and Environmental Engineering, the Department of Building Construction and the Pamplin College of Business. The majority of courses are drawn from existing curricula in Civil Engineering and Building Construction. Complementary courses from the College of Business provide the balance.

Consistent with the general program goal of facilitating development of student competence necessary for entry into the construction industry or graduate school, the School has developed the following program objectives:

Within a few years of curriculum completion, graduates of the Construction Engineering and Management program should be able to combine skills gained through academic preparation and post-graduation experience so that they can:

- Identify, design, analyze, integrate and manage the technical, material, financial, legal and personnel administration aspects that support construction operations, projects and organizations throughout the project lifecycle, i.e., from programming to decommissioning.
- Incorporate safety, efficiency, cost effectiveness, environmental sensitivity and social awareness into the development, planning and implementation of construction operations and processes.

- Apply skills of effective communication, entrepreneurship, teamwork, values-based leadership, professional and ethical behaviors that are the necessary compliment to technical competence.
- Continue their professional development and learning which may include professional licensure or certification, graduate level education, continuing education courses, self-directed study and active involvement in the construction community.

Classroom instruction in the construction engineering and management program is reinforced by instructional laboratories, field trips and guest lectures by leading construction professionals. The department seeks to employ the latest educational technology and innovative teaching methods.

Students in the School have the opportunity to participation in a summer internship program during which they may apply the concepts learned in the classroom in real world applications. The School encourages all students to participate in professional work experience prior to graduation.

TOP

Class Size Limitation

A proposal to limit enrollment in the BS CEM degree has been approved by University governance. The proposal limits enrollment to 40 students per year. The criteria that must be met in order to gain entry into the program include the following three inputs, weighted accordingly:

1. Overall GPA. (60%)
2. The grade obtained for a statement of intent outlining career objectives and experience in the construction industry prepared and submitted to a three person faculty committee. (20%)
3. The grade obtained in an interview to determine commitment to success with a two person faculty committee. (20%)

TOP

Accreditation and Registration

The Construction Engineering and Management degree will seek accreditation by the Engineering Accreditation Commission of ABET after the first class has graduated in May 2009. Accreditation, if successful, is applied retroactively within a two-year period, therefore students graduating in May 2009 will benefit from successful accreditation in the same manner as future classes.

The Virginia State Board of Registration has granted permission for seniors studying towards the BS CEM degree to sit for the Fundamentals of Engineering (FE) exam during the 2008/2009 academic year in anticipation of ABET EAC accreditation.

The contact person for the undergraduate Construction Engineering and Management program is Dr. Christine Fiori, at 540/239-3389 or e-mail: cfiori@vt.edu.

Construction Engineering and Management Program (for 2010)

Note: Graduation requires a total of 133 semester credits. Requirements are subject to change; prospective students should contact the department prior to initiating individual programs of study.

First Year	
First Semester	
CHEM 1035: General Chemistry or CHEM 1074: Chemistry for Engineers	3
CHEM 1045: General Chemistry Lab or CHEM 1084: Chemistry for Engineers Lab	1
MATH 1205: Calculus	3
MATH 1114: Linear Algebra	2
ENGL 1105: Freshman English	3
ENGE 1024: Engr. Exploration	2
Liberal Education Elective: See remarks	1
Credits	15
Second Semester	
PHYS 2305: Foundations of Physics I	4

MATH 1206: Calculus	3
MATH 1224: Vector Geometry	2
ENGL 1106: Freshman English	3
ENGE 1114 Exploration of Engineering or ENGE 1104 Exploration of Digital Future	2
Liberal Education Elective: See remarks	3
Credits	17
Second Year	
First Semester	
PHYS 2306: Foundations of Physics I	4
MATH 2224: Multivariable Calculus	3
ESM 2104: Statics	3
GEOS 2104: Elements of Geology	3
CEE 2804: Intro. to CEE	2
ENGE 2824: CEE Drawings & CAD	1
Credits	16
Second Semester	
STAT 3704: Statistics for Engr. Applications	2
MATH 2214: Differential Equations	3
ESM 2204: Mech. of Deformable Bodies	3
ISE 2014: Engineering Economy	2
CEE 2814: CEE Measurements	4
Liberal Education Elective: See remarks	3
Credits	17
Third Year	
First Semester	
CEE 3404: Theory of Structures	3
CEE 3014: Construction Management	3
CEE 3514: Intro to Geotechnical Engr	3
CEE 3804: Computer Application in CEE	3
CEE 4014: Estimating	3
CEE 4074: Construction Means & Methods	3
Credits	18
Second Semester	
CEE 3684: CEE Materials	3
CEE 3434: Design of Steel Structures	3
BC 4014: Building Systems Tech II	3
BC 3064: Building Systems Tech Lab	2
ENGL 3764: Technical Writing	3
ECON 2005: Principles of Economics	3
Credits	17
Fourth Year	
First Semester	
CEE 3424: Reinforced Concrete Design	3
CEE 4024: Const. Control Techniques	3
CEE Technical Elective: See Remarks	3
BC 4434: Construction Practice I	3
ECON 2006: Principles of Economics	3
Business Elective: See Remarks	3
Credits	18
Second Semester	
CEE 4804: Prof. & Legal Issues in Engr.	3

CEE 3104: Intro. to Environmental Engr. or CEE 4554: Natural Disaster Mitigation & Recov.	3
BC 4444: Construction Practice II	4
BC4064: Construction Practice Lab	2
Business Elective: See Remarks	3
Credits	15

REMARKS:
Curriculum for Liberal Education Remarks: Engineering students entering the university in 1999-2000 or later are required to meet the following Curriculum for Liberal Education requirements, in addition to their college and departmental requirements:

Credits	
ViEWS - met by a designated sequence of required CEM courses and ENGL 3764	6
CLE Area 2: Ideas, Cultural Traditions and Values	6
CLE Area 3: Society and Human Behavior	6
CLE Area 6: Creativity and Aesthetic Experience	1

Business Electives – must be taken from list shown on applicable CEM checksheet.

CEE Technical Elective Remarks – must satisfy departmental requirements as shown on the appplicable CEE checksheet.

Undergraduate Course Descriptions

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

Undergraduate Course Descriptions within the CEM Major

Building Construction (BC)

3064: BUILDING SYSTEMS TECHNOLOGY LAB
Develop a competency in the application of Building Environmental Systems, through modeling, scheduling, estimating, and experiments in support of a senior capstone project. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 4014, CEE 3014, CEE 4074. (1H,2L,2C)

4014: BUILDING SYSTEMS TECHNOLOGY II
This course places an emphasis on the physical installation and integration of passive and active environmental control systems including: heating, ventilation, air conditioning, lighting, acoustics and plumbing. Lectures by faculty and seminars by construction industry practitioners address issues that are relevant to illustrating the applications resulting from theory studied in BC 4004. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 3064, CEE 3014, CEE 4074. (2H,3L,3C)

4064: CONSTRUCTION PRACTICE LAB
Application of the business and construction practices related to operation of a construction company to the execution of a senior capstone project. All project management concepts learned in prior courses are applied in the capstone lab experience. Written and oral work is formally presented and critiqued among construction faculty, students, and industry professionals. Pre: 4434. Co: 4444. (1H,2L,2C)

4434: CONSTRUCTION PRACTICE I
Business and construction practices related to operation of a construction company are studied. Construction law is examined as it relates construction, financial and personnel management. Project management topics studied in this course include permitting, site evaluations, design development and design phase considerations such as preliminary estimates and project constructability. Writing Intensive (WI) course. I Pre: (4014, 3064), (2044 or CEE 3014, CEE 4074). (3H,3C)

4444: CONSTRUCTION PRACTICE II
This course explores and applies the business and construction practices related to operation of a construction company to a capstone experience. Construction law is examined as it relates to construction, financial and personnel management. Project management topics studied in this course are applied in the corequisite lab. This course is formally designated as a writing intensive course. Formal written and edited and oral presentations are presented and critiqued by the BC faculty team, the writing resource center, students and industry

professionals. Pre: 4434. Co: 4064. (3H,3L,4C) II.

Civil and Environmental Engineering (CEE)

2804: INTRODUCTION TO CIVIL AND ENVIRONMENTAL ENGINEERING
Overview of the civil engineering profession and the undergraduate program of study. The fundamentals of good oral and written communication skills for the Civil Engineer are emphasized. An introduction to engineering library resources is also included. Pre: ENGE 1024. (3H,2C) I,II.

2814: CIVIL AND ENVIRONMENTAL ENGINEERING MEASUREMENTS
Introduction to various data measurement issues in civil and environmental engineering, including collection techniques, analysis, error, and statistical evaluation in all sub-disciplines. Spatial measurement topics include GPS, leveling, distance and angular measurement, mapping and topographic surveys, automated data collection, terrain models, earthwork methods, construction surveying, geodesy, and GIS. Pre: BC students required to take the BC 1224 pre-requisite, they are exempt from the co-requisite ENGE 2824. CEE students are required to take the ENGE 1114 pre-requisite. Pre: ENGE 1114 or BC 1224, (MATH 1206 or MATH 1206H), (MATH 1224 or MATH 1224H). Co: ENGE 2824. (3H,3L,4C)

3014: CONSTRUCTION MANAGEMENT
Fundamental elements involved in managing construction projects. Management structure, construction contracts, equipment and labor productivity, scheduling, quality assurance, and cost control. Junior standing required. (2H,3L,3C) I,II.

3104: INTRODUCTION TO ENVIRONMENTAL ENGINEERING
Overall view of environmental engineering with emphasis on hazardous waste management, water treatment, wastewater treatment, air pollution and its control, solid waste management, groundwater pollution and environmental regulations. A grade of C- or better required in pre-requisites CHEM 1035, 1045, MATH 1205, 1206, and PHYS 2305. I, II. Pre: (CHEM 1035 or CHEM 1074), (CHEM 1045 or CHEM 1084), (MATH 1206 or MATH 1206H or MATH 2016), (PHYS 2305 or PHYS 2205). (3H,3C)

3404: THEORY OF STRUCTURES
Fundamental tools and methods of structural analysis: moment-area, slope-deflection, force, and moment-distribution methods. Influence lines. Application to beams, trusses, and simple frames. A grade of C- or better required in pre-requisite ESM 2204. I.II Pre: ESM 2204. (3H,3C)

3424: REINFORCED CONCRETE STRUCTURES I
Behavior and design of reinforced concrete members based on ultimate strength. Beams and slabs in flexure, shear and torsion, development of reinforcement. Columns with axial force plus bending, slenderness effects in columns. A grade of C- or better required in pre-requisite 3404. I,II Pre: 3404. (3H,3C)

3434: DESIGN OF STEEL STRUCTURES I
Behavior and design of structural steel members and steel-frame buildings, including simple and fixed connections. AISC specifications; elastic theory. Design members to resist tension, compression, bending, torsion; plate girders, composite beams. ESM 3054 may be taken in place of co-requisite CEE 3684. Pre: 3404. Co: 3684. (2H,3L,3C) I,II.

3514: INTRO TO GEOTECHNICAL ENGR
Engineering properties of soils including their descriptions and classifications, the effects of water, soil strength and compressibility. Introduction to soil stabilization, earth pressures, slope stability, and foundations. A grade of C- or better required in pre-requisites GEOS 2104 and ESM 2204. Pre: ESM 2204, (GEOS 1004 or GEOS 2104 or GEOL 1004 or GEOL 2104). (2H,2L,3C) I, II.

3684: CIVIL ENGINEERING MATERIALS
Characteristics of constituent materials and the design and behavior of Portland cement and bituminous concrete mixtures with demonstrated laboratory experiments. Pre: CHEM 1035, CHEM 1045, ESM 2204, CEE 2814, (GEOS 2104 or GEOS 1004). (2H,3L,3C) I, II.

3804: COMPUTER APPLICATIONS FOR CIVIL AND ENVIRONMENTAL ENGINEERS
Introduction to computer applications in civil and environmental engineering. Integration of design, data management, computer programming and problem solving skills with computer tools and techniques. Topics include systems analysis, optimization, database management, computer programming and data structures. Junior Standing Required. (2H,2L,3C) I,II.

4014 (BC 4024): ESTIMATING, PRODUCTION, AND COST ENGINEERING
Interpretation of plans and specifications, preparation of construction estimates, and cost control. Methods analysis, resource requirements, and resource costs in building systems, including system components, and in large-scale civil engineering works such as highways, bridges, and hydraulic structures. A grade of C- or better required in pre-requisite 3014. I,II Co: 3014. (3H,3C)

4024: CONSTRUCTION CONTROL TECHNIQUES
Techniques used to plan, schedule, and control the Construction Process. Emphasizes manual and computer-based approaches. Focuses on an analytical approach towards the construction process whereby good technical methodologies and solutions are converted to reality through construction practices. I Pre: 3014. Co: 4014. (3H,3C)

4074: CONSTRUCTION ENGINEERING: MEANS AND METHODS
Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility.

Selection and optimization of individual units as well as the systems needed to produce the required work to the required quality on time and on budget. I (3H,3C)

4554: NATURAL DISASTER MITIGATION AND RECOVERY
Causes, mechanics, classifications, and forces associated with tornadoes, hurricanes, floods, earthquakes, and landslides. Resistance evaluation for existing ground, facilities and structures. Hazard-resistant design of new facilities. Risk and reliability assessment and decision analysis. Strategies and designs for natural disaster risk mitigation. Emergency response for protection of life and property and restoration of lifelines. Includes an interdisciplinary team project. A grade of C- or better required in pre-requisites 3304, 3514 and 3684. II Pre: 3304, 3514, 3684. (3H,3C)

4804: PROFESSIONAL AND LEGAL ISSUES IN ENGINEERING
Analysis of the legal, professional, and ethical aspects of engineering practice; introduction to contract law and contract dispute resolution, professional liability, and other aspects of law relevant to engineering practice; professional registration and codes of ethics. Pre: Senior standing in engineering. (3H,3C) I,II.

College of Architecture & Urban Studies

School of Architecture + Design: Architecture

http://www.archdesign.vt.edu

J.S. Poole, Director School of Architecture + Design
K. Albright, Assistant Director, and Chair, Foundation Program
M. Ermann, Chair, Architecture 2-3
T. Surjan, Chair, Architecture 4-5
S. Thompson, Chair, Graduate Program
Professors: S. Choudhury; A.J. Davis; D. Dunay; R. Dunay; D. Egger; J. Holt; J. S. Poole; H.L. Rodriguez-Camilloni; H. Rott; R. Schubert; M. Setareh; F. Weiner
Associate Professors: K. Albright; M. Cortes; K. Edge; M. Ermann; D. Dugas; P. Emmons; M. Feuerstein; W. Galloway; S. Gartner; D. Jones; J. Jones; S. Martin; M. McGrath; S. Piedmont-Palladino; H. Pittman; H. Schnoedt; T. Surjan; S. Thompson
Assistant Professors: J. Bassett; M. Breitschmid; H. Bryon; E. Grant; M. Schneider; A. Sharma; J. Wheeler
Visiting Assistant Professors: P. Doan; M. Zawistowski
Instructor: R. Holt; H. Hollander
Adjunct Professors: P. Clay; B. Ferguson; J. Foote; C. Fultz ; R. Gurney; D. Jameson; M. Johnson; D. Lever; G. Makrinos; C. Pritchett; J. Ritter; L. Salom; J. Schippers; S. Seibers; A. Singh; S. Small; C. Vorster; P. Zellner-Bassett
Professor Emerita: M. Bliznakov
Professor Emeritus: W. Brown; W. Kark; F. Ruiz; D. Kilper; J. Wang
Associate Professor Emeritus: J. Stoeckel
Assistant Professor Emerita: E. Braaten

Overview

Architecture enriches our lives by offering us environments that are sensibly compelling, thought provoking, and capable of lifting our spirits. In addition to being beautiful, architecture is, by ancient definition, functional and durable. Like art, architecture is permeated by dualities. It is stable and transitory, measurable and immeasurable, and capable of both being touched and touching us. Like science, architecture involves systematic study. Its methods are iterative, experimental, and rely on intense observation. By intertwining the poetic and practical, architecture is uniquely poised to address the challenges of contemporary life and build the culture of the 21st century.

The professional curriculum in architecture requires five years of study for the first professional degree, the Bachelor of Architecture (B. Arch.).

The first professional degree programs at Virginia Tech, the five-year Bachelor of Architecture degree (B. Arch.), the Master of Architecture II (M. Arch II), and the Master of Architecture III (M. Arch. III) degrees, are fully accredited for the current maximum six-year term of accreditation by the National Architectural Accrediting Board.

All students in the School of Architecture + Design – Architecture, Industrial Design, Interior Design and Landscape Architecture – begin their studies in a common first year foundation program. Following the foundation program, students pursue professional studies in the 2-3 and 4-5 programs.

Foundation Design Program – First Year

The focus in the first year of the Foundation Program is involved with basic elements of design, addressed visually, conceptually, and

haptically. Studies are undertaken in two and three dimensions using various materials and tools. Inquiries are focused on the process of design, discovering, through experiment, methods of working that develop aesthetic judgment and means of self-evaluation.

TOP

Professional Program – Second, Third, Fourth, and Fifth Years

The Professional Program begins with design theory and process, covering building design as an interactive investigation of human factors, environmental forces, and technology. The **second year** is an introduction to the discipline of architecture, isolating and intertwining fundamentals that contribute to the complex totality that constitute a work of architecture. Students explore how architecture concentrates and conveys natural and cultural forces through means specific to the discipline. Studies focus on fundamentals realized artistically and practically in works by selected architects. The course articulates the unique reality of architecture through the study of basic interrelationships of material, construction, site, and program and introduces the student to the complex interplay of situation, space and time in the making of places. In addition, the course examines interdisciplinary sources such as art, science, and philosophy for the purpose of establishing the content architecture shares with other forms of knowledge and how that content, expressed through architecture, contributes to human well-being. Concepts in the course communicated through drawings and models, as well as written and verbal discourse.

Emphasis is placed on intellectual discipline, dialogue, assertion of interest, and a self-motivated search for critical issues.

The **third year** provides for study of fundamental design principles, technical concepts and applications, and measures of quality in architecture. The Architecture III design studio gives the student experience with practical design problems and provides order to the student's gradual exploration and learning of the nature and means of achieving architecture. Associated with Architecture Ill are lecture series intended to expose the students to accumulated background and practical experience in the design and construction of buildings.

During the **fourth** and **fifth** years, the program focuses on building design and the fifth-year thesis project. Areas of special interest such as advanced offering in building technology are also pursued.

Fourth Year design offers students the option to participate in one of the off-campus programs: the Extern Program, the Washington-Alexandria Center, or the Study Abroad Program. Fourth year on-campus studio options encourage the student to define himself or herself within the professional to summarize his or her abilities as an architect. It is a time in which practical and qualitative constraints bring the student into a confrontation with standards. At this point the responsibility of development shifts from assignment to formulation by the student.

Off-campus options for fourth year architecture majors:

- The Center for European Studies and Architecture, located in Riva San Vitale, Switzerland, is a 19,000 square foot complex of buildings centered around an 18th century villa and private gardens on the southern tip of Lake Lugano. The Center has residence and dining facilities for approximately 45 students. Each semester approximately 15 students from the School of Architecture + Design are in residence at the Center along with university students from other academic disciplines. Study, research, and travel are structured to advance first-hand knowledge of the architecture, geography, and culture of Europe.
- The Chicago Studio is an alternative to the traditional upper-level design studio integrating education and practice in a direct way for architecture and design students. Its distinctive structure and curriculum promotes a collaborative design process encompassing multiple points of view within academia, the profession, and the broader community.
- The Professional Xtern Program allows students to spend a minimum of one semester in an approved professional setting and receive 12 hours of academic credit. This program provides a valuable link between the academic environment and government agencies, museums, architectural offices, industrial design offices, and graphic design offices throughout the world ? educational institutions throughout the world.
- The Washington-Alexandria Architecture Center affords students from the School of Architecture + Design and related college disciplines the opportunity to study with students and faculty from a national and international consortium of schools in the historic urban context of Old Town Alexandria. The Center, located in a turn-of-the-century schoolhouse redeveloped for College, has over 14,000 square feet of studio, design and review space, offices, exhibition space, shops, darkrooms and computer labs for the students and faculty of the consortium. The university owns an apartment and an office building adjacent to the facility, which creates an economic and convenient housing option for students studying at the Center.

The **fifth year** is conducted as advanced independent study with individual faculty advisors in a mode comparable to graduate studies and is intended to provide the student an opportunity to develop depth and expertise within a particular area in the field of architecture. Fifth-year students formulate and accomplish independent work in the form of a terminal project. Working with their advisors, students, prepare programmatic statements, meet informally on a regular basis, and have formal periodic reviews throughout the year. Students are required to leave a portfolio with the school upon graduation.

The first professional degree programs (B. Arch., M. Arch.) in architecture are accredited by the National Architectural Accrediting Board, and the degrees are recognized by the National Council of Architectural Registration Boards as the necessary educational qualifications for registration examinations.

- In the United States, most state registration boards require a degree from an accredited professional degree program as a

prerequisite for licensure. The National Architecture Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture and the Doctor of Architecture. A program may be granted a 6-year, 3-year, or 2-year term of accreditation, depending on its degree of conformance with established educational standards.

- Master's degree programs may consist of a preprofessional undergraduate degree and a professional graduate degree that, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The four-year, pre-professional degree, where offered, is not accredited by the NAAB. This degree is not offered at Virginia Tech. The pre-professional degree is useful for those wishing a foundation in the field of architecture, as preparation for either continued education in a professional degree program or for employment options in architecturally related areas.

TOP

Bachelor of Architecture Program Requirements

Required Curriculum for Liberal Education Courses	**33 credits**
English 1105-1106; Freshman English: Writing and Discourse	6
Math 1535-1536; Geometry of Mathematics and Design	6
Society and Human Behavior Option (Social Sciences)	6
Scientific Reasoning and Discovery Option (Lab Science)	6
Ideas, Cultural Traditions and Values Option (Humanities)	6
Creative and Aesthetic Experience (satisfied by Arch 1015)	
Critical Issues in a Global Context	3
Required Foundation Program Courses	**35 credits**
Arch 1015, 1016; Foundation Design Lab (1st year)	12
Arch 2015, 2016: Architecture II (2nd year)	12
Arch 2034: The Art of Building (2nd year)	2
ESM 3704, Basic Principles of Structures (2nd year)	3
Arch 3115, 3116: History of Architecture (2nd year)	6
Required Professional Program Courses	**68 credits**
Arch 3015, 3016: Architecture III (3rd year)	12
Arch 3045, 3046: Building Assemblies (3rd year)	4
Arch 3054: Building Analysis (3rd year)	2
Arch 4015, 4016: Architecture IV (4th year studio)	14
Arch 4055. 4056: Environment and Building Systems (3rd year)	6
Arch 4075: Building Structures I (2nd year)	3
Arch 4076: Building Structures II (3rd year)	3
Arch 4034: Building Cities (4th year)	3
Arch 4044: Professional Practice (4th or 5th year)	3
Arch 4515: Architecture V (5th year studio)	9
Arch 4516: Architecture V (5th year studio)	6
Arch 4524: Thesis Documentation (5th year)	3
Professional Elective Courses	**6 credits**
To be selected from an approved list of courses supplied by the school	
Free Electives or additional Professional Electives	14
Total required for B.Arch.	**156 credits**

Satisfactory Progress

In addition to the university requirements, upon completion of the second year in the program, students must have completed:

Arch 1015-1016, Arch 2015-2016, Arch 2034, ESM 3704, Arch 4075, Arch 3115-3116, with a minimum in-major grade point average of 2.00 or above.

Graduation Requirements

Upon successful completion of program requirements of the foundation level of study and the professional levels of study in architecture and with completion of 156 credit hours of study, a first professional degree of Bachelor of Architecture is awarded.

TOP

Course Descriptions (ARCH)

1014: INTRODUCTION TO ARCHITECTURE: LESSONS IN FORM & CULTURE
Introduction to the discipline of architecture for non-architecture majors. Emphasis on the basic elements of design and the relationships of a culture to the forms, shapes, and structures it expresses in architectural production. (3H,3C)

1015-1016: FOUNDATION DESIGN LABORATORY
Introduction to the discipline of architecture. Focus on basic elements of design, addressed visually, conceptually, and haptically. Studies undertaken in two and three dimensions using various materials and tools. Inquiry into the process of design, discovering, through experiment, methods of working that develop aesthetic judgment and means of self-evaluation. Emphasis on intellectual discipline, dialogue, assertion of interest, and a self-motivated search for critical issues. (2H,12L,6C)

2015-2016: ARCHITECTURE II
Introduction to the discipline of architecture, isolating and intertwining fundamentals that contribute to the complex totality that constitute a work of architecture. Explores how architecture concentrates and conveys natural and cultural forces through means specific to the discipline. Focus on fundamentals realized artistically and practically in works by selected architects. Articulates the unique reality of architecture through the study of basic interrelationships of material, construction, site, and program. Introduces the complex interplay of situation, space and time in the making of places. Examines interdisciplinary sources such as art, science, and philosophy for the purpose of establishing the content architecture shares with other forms of knowledge and how that content, expressed through architecture, contributes to human well-being. Concepts communicated through drawings and models. Emphasis on intellectual discipline, dialogue, assertion of interest, and a self-motivated search for critical issues. Pre: 1016. (2H,12L,6C)

2034: THE ART OF BUILDING
Lecture/seminar introduction to the discipline of architecture, isolating and intertwining fundamentals that contribute to the complex totality that constitute a work of architecture. Explores how architecture concentrates and conveys natural and cultural forces through means specific to the discipline. Focus on fundamentals realized artistically and practically in works by selected architects. Articulates the unique reality of architecture through the study of basic interrelationships of material, construction, site, and program. Introduces the complex interplay of science and philosophy for the purpose of establishing the content architecture shares with other forms of knowledge and how that content, expressed through architecture, contributes to human well being. Co: 2016. (2H,2C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3015-3016: ARCHITECTURE III
First design laboratory for the Professional Program in Architecture. Provides for exploratory investigation and analysis of the fundamental design principles, technical concepts and applications, and the measures of quality in architecture. Co: 3045 for 3015; 3046, 3054 for 3016. (1H,12L,6C)

3045-3046: BUILDING ASSEMBLIES
The designs of building assemblies, elements, systems and sub-assemblies are studied. Building assemblies as controlled by formal idea, geometry, construction, materials, details, structure, function, enclosure, and finish work are considered. Pre: 2016. Co: 3015 for 3045; 3016, 3054 for 3046. (2H,2C)

3054: BUILDING ANALYSIS
Study of exemplary built works of architecture through analysis of design documents, interviews, and inspection of actual construction. Course is completed as a group project resulting in both an oral presentation and a written document. Pre: 3015. Co: 3046, 3016. (2H,2C)

3115,3116: HISTORY OF ARCHITECTURE
A review of world architecture, predominantly but not exclusively with reference to Occidental building art. The study of principles concepts and representations of buildings and structures from the 4,000 BC to the present through reading, drawing, and writing are important aspects of the course. Pre: 1016 for 3115; 3115 for 3116. (3H,3C)

3514: DESIGN-RELATED MEDIA
Properties and uses of various media, materials and processes as tools for analysis, documentation and presentation of the designed environment. Basic skills and techniques relating to photography, printmaking, and pottery will be explored. Repeatable with a maximum of 6 credits. (3H,3C)

3954: STUDIO-STUDY ABROAD

The Europe Studio offers students the opportunity to make comparative studies of European cultures, as well as to study the relationship of culture to the physical environment, the organization of cities, and the history and behavior of their inhabitants. Exercises include analysis and documentation of elements of the physical environment, exploration of the interface between buildings and the fabric of the existing city, and examination of the professional community's reactions to urban design solutions. X-grade allowed. (*H,6C)

3974: INDEPENDENT STUDY
Variable credit course.

3984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4015-4016: ARCHITECTURE IV
Design laboratory in conjunction with alternative studies in one of the College's off-campus centers. Focus on the evaluation of skills developed in the third year professional studies and emphasis toward individualized topical areas of study leading to the development of a thesis project. X-grade allowed. Pre: 3016 for 4015; 4015 for 4016. (2H,12L,7C)

4034: BUILDING CITIES
Analytical studies in the historical evolution of cities, towns and villages. Comparative studies of urban form in relation to their constructive and imaginative means with an emphasis on modern construction processes. Specific case studies in designing and building cities. Co: 4016. (3H,3C)

4044 (LAR 4124): PROFESSIONAL PRACTICE
Introduction to scope and diversity of the building enterprise, addressing private and public macroeconomic, industrial, technical, professional, and regulatory institutions. Analysis of historic evaluation of professional roles and practices; emergence of new modes of practice, including innovative facilities procurement methods. (3H,3C)

4055,4056: ENVIRONMENT AND BUILDING SYSTEMS
A design oriented study of environmental forces, environmental impacts of the built environment, and related building environmental control, life safety and service systems, with concern for the human psycho-physical impacts of building form and systems performance. (3H,3C)

4075-4076: BUILDING STRUCTURES
Building structures in steel, timber, and reinforced concrete; design of typical components: beams, slabs, columns, beam-columns, connections, and foundations; design of retaining walls; the resistance of buildings to gravity and lateral force action; building stability; floor/roof framing systems; design of simple buildings. Pre: ESM 3704 for 4075; 4075 for 4076. (3H,3C)

4144: ADVANCED BUILDING STRUCTURES I
Study of long-span building structures. Introduction to geometry, form, and structure of folded and bent surfaces. Study of space grid geometry, close-packing systems, and cellular tensegrity. Approximate design of folded plate structures, single and double curvature shells, single and double layer space frames, suspension roofs, tents, and pneumatic structures. Pre: 4075, 4076.
(3H,3C)

4154: ADVANCED BUILDING STRUCTURES II
Study of highrise structures ranging from building slabs and blocks, terraced buildings, and skyscrapers to towers. The complexity of load action including wind, earthquake, and hidden loads. The effect of building height, form, and proportion on force action; considerations of stability and redundancy. Preliminary design of masonry buildings, core structures, suspension buildings, braced skeletons, rigid frames, interstitial systems, staggered truss buildings, tubes and hybrid structures. Pre: 4075, 4076. (3H,3C)

4164: COMPUTER APPLICATIONS IN DESIGN
Computer system fundamentals. Very brief introduction to assembly programming. Programming in a high level language. Construction of a simple text editor. Construction of a simple relational file. Computer graphics fundamentals. Geometric transformations. 3-space geometry and projections. (3H,3C)

4204: URBAN TECHNOLOGY AND ARCHITECTURE
Architecture as determinant of urban spaces and urban form; perceptual, morphological, and typological characteristics of urban spaces as expressions of social values, ideals, and technological innovation. Theoretical models of technological, function, environmental, and social determinants of urban configurations are related to their cultural and historic precedents. X-grade allowed. (3H,3C)

4214: TOPICS IN ARCHITECTURE HISTORY AND THEORY
Topics in the history of architecture and theory, predominantly with reference to the Western World. Special emphasis on methods of analysis and interpretation. Repeatable with a maximum of 9C. X-grade allowed. Pre: 3115, 3116. (3H,3C)

4304: TOPICS IN DESIGN METHODS
Topics in systematic methods of design and the nature of the design process including application of creative techniques, analogous thinking, analytic methods, computer-aided procedures, and information handling in design. Repeatable with a maximum of 6 credits. X-grade allowed. (3H,3C)

4414: ADVANCED ENVIRONMENT BUILDING SYSTEMS
Advanced studies of environment and building systems, including development in building systems, urban systems, service systems, construction systems, materials and component systems, psycho-physical considerations, systems analysis, and computer technology. May be repeated for a maximum of 9 credit hours in varied options offered. X-grade allowed. Pre: 4055, 4056. (2H,3L,3C)

4515-4516: ARCHITECTURE III: DESIGN AND ALLIED STUDIES
Advanced independent architectural research requiring articulation of a conceptual and professional position. This position is realized in a terminal

thesis project completed in the second semester of the fifth year. X-grade allowed. Pre: 4016 for 4515; 4515 for 4516. 4515: (2H,20L,9C) 4516: (2H,16L,6C)

4524: THESIS DOCUMENTATION
During the second semester of the fifth year, the student takes a required three hour thesis documentation course where their conceptual and professional position is defined and tested by the documentation of the terminal architectural project. Pre: 4515. Co: 4516. (3H,3C)

4654 (UAP 4654): URBANIZATION AND URBANISM IN EUROPE
This course is designed to provide an introduction to European urbanization for students who intend to pursue a study abroad program in Europe, or who have already done so. The course adopts a comparative approach to cities, urban form and urban living, and an understanding of urbanization processes, including urban design and planning, in different parts of Europe. Pre: UAP 2014 or ARCH 2016. (3H,3C)

4705-4706: QUALIFYING DESIGN SEMINAR
Exploratory overview of selected theories and issues relevant to the design and use of the environment. 4705: Emphasis on history, human behavior, and environmental context as it relates to architecture. 4706: Presentation and discussion of the nature of principal construction materials in relation to building design. Characteristics of primary structural materials: wood, steel, concrete, masonry; environmental control systems; supporting technologies. Not for credit for majors holding a first professional degree in architecture. (3H,3C)

4715-4716: QUALIFYING DESIGN LABORATORY
4715: Design laboratory in which student and faculty teams explore the nature of problems and potentials with which architecture is concerned, and experimentally develop methods and process through which existing contexts are transformed into new conditions. 4716: Provides introduction to basic concepts of building structures, materials, and enclosure systems, and appropriate site and climate responses. Not for credit for majors holding a first professional degree in architecture. X-grade allowed. (3H,18L,9C)

4755-4756: BUILDING ENVIRONMENTAL SYSTEMS
This sequence concentrates on defining different intervention techniques available to the architect to articulate the relationship between the outside and inside environment of buildings. These intervention techniques strive towards a fit between built form and the thermal, luminous, sonic, and water/waste environment. Pre: 4706. (3H,3C)

4775-4776: BUILDING STRUCTURES
Building structures in steel, timber, and reinforced concrete; design of typical components: beams, slabs, columns, beam-columns, connections, and foundations; design of retaining walls; the resistance of buildings to gravity and lateral force action; building stability; floor/roof framing systems; design of simple buildings. Pre: ESM 3704 for 4775; 4775 for 4776. (3H,3C)

4904: PROFESSIONAL STUDIES
Pass/Fail only. X-grade allowed.
(1H,1C)

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Architecture & Urban Studies

School of Architecture + Design : Industrial Design

http://www.archdesign.vt.edu

Ronald B. Kemnitzer, FIDSA, Chair
Professors: R. Kemnitzer; M. Vernon
Associate Professors: E. Dorsa; W. Green
Assistant Professors: A. Sharma
Adjunct Professors: R. Reuter; M. Sullivan

Overview

As described by the Industrial Designers Society of America, “Industrial Design (ID) is the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer.

Industrial designers develop these concepts and specifications through collection, analysis and synthesis of data guided by the special requirements of the users, client and manufacturer. They are trained to prepare clear and concise recommendations through drawings, models and verbal descriptions.

Industrial design services are often provided within the context of cooperative working relationships with other members of a development group. Typical groups include management, marketing, engineering and manufacturing specialists. The industrial designer expresses concepts that embody all relevant design criteria determined by the group.

The industrial designer's unique contribution places emphasis on those aspects of the product or system that relate most directly to human characteristics, needs and interests. This contribution requires specialized understanding of visual, tactile, safety and convenience criteria, with concern for the user. Education and experience in anticipating psychological, physiological and sociological factors that influence and are perceived by the user are essential industrial design resources.”

The internationally recognized program at Virginia Tech, fully accredited by the National Association of Schools of Art and Design, prepares individuals to enter this dynamic field through a rigorous curriculum and an experienced, dedicated faculty.

Program Requirements

Required Curriculum for Liberal Education Courses	**33 credits**
English 1105-1106: Freshman English Writing and Discourse	6
Math 1535-1536: Geometry and Mathematics of Design	6
Society and Human Behavior Option (Social Sciences)	6
Scientific Reasoning and Discovery (Lab Science)	6
Ideas Cultural Traditions and Values Option (Humanities)	6
Creative and Aesthetic Experience (satisfied by Arch 1015)	

Critical Issues in a Global Context	3
Required Industrial Design and Architecture Courses	
Arch 1015, 1016: Foundation Design Laboratory (1st year)	12
IDS 2015-2016 Industrial Design Lab II	12
IDS 2065 Design Visualization	2
IDS 2066 Design Visualization	1
IDS 2044 Human Factors	3
IDS 2304 Computer Aided Industrial Design	3
IDS 2114 History/Theory Industrial Design	3
IDS 2124 Hist/Theory of ID-Designers	3
Arch 3115-3116: History of Architecture (2nd year)	6
IDS 3015-3016 Industrial Design Lab III	14
IDS 2034 Materials and Processes	3
IDS 3514: Design Research (3rd year)	3
Arch 3514: Design Related Media	3
IDS 4015-4016 Industrial Design Lab IV	12
IDS 4044 Professional Practice & Entreneurship	3
Professional Elective Courses	**9**
To be selected from an approved list of courses supplied by the school	
Free Electives	**6**
Can be taken at any time allowed in the student's program of study	
Total credit hours required for B.S.	125

Minor in Industrial Design

Please visit the School of Architecture + Design website to view the current requirements for the Industrial Design Minor at http://archdesign.vt.edu/industrial-design/minor.

Course Descriptions (IDS)

2015-2016: INDUSTRIAL DESIGN LABORATORY II
Introduction to the discipline of industrial design and the critical elements that contribute to the complexity of a work of design. Emphasis on intellectual discipline, skills development, dialogue, assertion of interest, and a self-motivated search for critical issues. Pre: ARCH 1016 for 2015; 2015 for 2016. (3H,9L,6C)

2034: MATERIALS AND PROCESSES
A survey of current materials, processes, techniques and equipment used in the design of products for mass production. (3H,3C)

2044: HUMAN FACTORS
This course examines human factors as it informs the design process, and as a tool to maximize the physical and psychological aspects of design toward the establishment of a human centered design. Frameworks of industrial design philosophy, research methods, standards and data, human issues, cultural context, and design outcomes. (3H,3C)

2065-2066: DESIGN VISUALIZATION
An introduction to two-dimensional modes of representation. Emphasis is placed on the development of drawing skills to facilitate documentation, analysis and presentation in the design process. Pre: ARCH 1016 for 2065; 2065 for 2066. 2065: (2H,2C) 2066: (1H,1C)

2114: HISTORY AND THEORY OF INDUSTRIAL DESIGN
The aesthetics and useful function of objects of industrial production. This class is based upon the concept that the values, ideals, and aspirations of a culture are expressed in material objects and a thorough knowledge of the history of the profession is essential to understand one's own particular circumstance and time. (3H,3C)

2124: HISTORY AND THEORY OF INDUSTRIAL DESIGN-DESIGNERS
The study of individual designers and how their values, ideals, and aspirations influence the evolution of design. (3H,3C)

2304: COMPUTER AIDED INDUSTRIAL DESIGN
An introduction to computer aided two and three- dimensional design and modeling as applied in industrial design using both solid and surface software modeling techniques. Pre: ARCH 1016. (3H,3C)

2974: INDEPENDENT STUDY

Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3015-3016: INDUSTRIAL DESIGN LABORATORY III
Introduction to systematic processes in design. Introduction and application of Human Factors and systematic planning methods in the development of industrial products in the areas of work, education and health. Development of professional presentation skills and methods. Pre: 2016 for 3015; 3015 for 3016. (3H,9L,7C)

3514: DESIGN RESEARCH
The course looks at the question of research and the ongoing exercise of re-definition for designers using examples of current design research corporations. Pre: 2016. (3H,3C)

4015-4016: INDUSTRIAL DESIGN LABORATORY IV
Detailed analysis, research and application of human factors to the design of equipment, work spaces and environments. Design and construction of full scale, interactive models and spaces. Introduction to group activities. Emphasis on the needs, the production and marketing factors of special populations, such as the elderly and disabled. Pre: 3016 for 4015; 4015 for 4016. (3H,9L,6C)

4044: PROFESSIONAL PRACTICE AND ENTREPRENEURSHIP
Introduction to the professional practice of Industrial Design. Bringing together multidisciplinary teams to engage in the process of bringing a product to market, building a business around a core competency in design, the structure of a design office, and the development and protection of intellectual property. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

College of Architecture & Urban Studies

School of Architecture + Design: Interior Design

http://www.interiordesign.arch.vt.edu/

G. Tew, Chair
Associate Professors: M. Casto; G. Tew; H. Renard; B. Whitney
Assistant Professor: L. Tucker
Associate Professor Emeritus: B. Parsons

Overview

The interior design program at Virginia Tech is dedicated to improving quality of life through design excellence, professionalism, and public service. With a curriculum that equally respects the importance of creative skill, history, building technology, ethics, innovation, and business practice, our graduates have the ability and confidence needed to immediately contribute to the profession.

Students in the interior program begin their studies in the foundation design laboratory during the first two semesters with architecture and industrial design students. From the beginning, both an independent and team approach to design solutions is encouraged.

In their professional studies students are challenged to think critically in their design of space and to develop solutions that not only enhance quality of life, but also protect the health, safety, and welfare of users as prescribed in the various codes and regulations that govern the work of interior designers. This philosophy is the core of our program. It establishes a foundation upon which each student graduates with creative ingenuity and professional responsibility.

Our CIDA program prepares future designers for licensure and practice. A degree from a CIDA accredited program is increasingly important as a requirement for professional certification and licensing of Interior Designers in the United States. Graduating from a CIDA accredited program is the first step in a three-part process in achieving certification or licensing as an interior designer in various states. The last two steps are to complete two years of assistantship as an interior designer and then passing the National Council for Interior Design Qualification (NCIDQ) examination. A CIDA accredited degree, work experience and passing the NCIDQ exam satisfy the requirements in Virginia for recognition as a “Certified Interior Designer.”

Required:

ARCH 1015: Foundation Design Lab	6
ARCH 1016: Foundation Design Lab	6
ENGL 1105: Freshman English	3
ENGL 1106: Freshman English	3
Math 1535: Geometry and Mathematics of Design	3
Math 1536: Geometry and Mathematics of Design	3
ITDS 1114: Design Appreciation	3
ITDS 2044: Interior Design I	6
ITDS 2134: Materials and Methods in Interior Design	3
ITDS 2054: Interior Design II	6
ITDS 3044: Interior Design III	6
ITDS 3054: Interior Design IV	6
ITDS 3125: History in Interior Design	3
ITDS 3126: History in Interior Design	3

ITDS 3175: Building Systems for Interior Design	3
ITDS 3176: Building Systems for Interior Design	3
ITDS 3954: Study Abroad or additional professional elective	3
ITDS 4044: Interior Design V	6
ITDS 4054: Interior Design VI	6
ITDS 4554: Contemporary Issues in Interior Design	3
ITDS 4994: Undergraduate Research	3
Professional Elective Course:	9
Curriculum for Liberal Education Requirements:	21
Free Elective:	9
Total Required for B.S. in Interior Design	120 credits

Satisfactory Progress

Students must maintain a 2.5 minimum GPA in ITDS courses for satisfactory progress toward the degree. If a student's GPA drops below 2.5 in ITDS courses, courses with a grade below 2.5 must be repeated to elevate the GPA to 2.5 before continuing in the degree. A minimum 2.5 GPA in ITDS courses is required for graduation.

Course Descriptions (ITDS)

1114: DESIGN APPRECIATION
Introduction to fundamental design concepts, design methods and the history of design. Examples drawn from architecture, interior design, industrial design, graphic design as well as vernacular craft and design traditions. Key concepts from art, literature and philosophy are discussed in relation to design theory. (3H,3C)

1124: DESIGN DRAWING
Drafting of floor plans, elevations, sections, and other orthographic drawings; measured perspective and black and white rendering. (6L,3C)

2044: INTERIOR DESIGN I
Exploration and development of interior spaces emphasizing spatial volume and presentation techniques. Pre: ARCH 1016. (1H,12L,6C)

2054: INTERIOR DESIGN II
Exploration and development of interior spaces emphasizing hospitality uses. Pre: 2044. (1H,12L,6C)

2134: MATERIALS AND METHODS IN INTERIOR DESIGN
Properties and appropriate use of materials in design and construction of building interiors. Floor, wall, and ceiling materials, and materials used in furnishings and equipment are included. Special attention is given to the health effects and environmental impact of material choices in interior design. (3H,3C)

2144: SECOND YEAR ID STUDIO
Focus on application of elements and principles of design to interior environments. Introduction to programming, space planning, human environmental interaction, and construction drawings in interior design. Pre: 2114, 1124, 1106. (1H,4L,3C)

2224: INTERIOR DESIGN GRAPHIC COMMUNICATION
Exploration and development of advanced presentation techniques appropriate for communicating interior design concepts. Special attention is given to utilizing digital media as support for visual and verbal communication. Pre: 2114. Co: 2144. (6L,3C)

2984: SPECIAL STUDY
Variable credit course.

3044: INTERIOR DESIGN III
Exploration and development of interior spaces emphasizing residential and mixed-use developments. Pre: 2054. (1H,12L,6C)

3054: INTERIOR DESIGN IV
Exploration and development of interior spaces emphasizing corporate office uses. Pre: 2054, 3176. (1H,12L,6C)

3114: FURNITURE DESIGN
The design of case furniture, millwork, and soft goods stressing materials, methods of construction, and ergonomic considerations in design. Pre: 1124, 2114, 2124. (6L,3C)

3124: INTERIORS
Introduction to commercial and institutional space planning. Advanced residential space planning and specifications. Pre: 2114. (1H,4L,3C)

3125,3126: HISTORY IN INTERIOR DESIGN
Surveys of significant developments in the design of interiors and furniture of western civilization. 3125: 3000 BC through the 19th century European.

3126: Colonial America through the 20th century modern design. University Core Area II required. (3H,3C)

3154: DESIGN STUDIO - FIBERART
Structural and applied design experience using fibers and fabrics. Techniques will include simple and complex weaving techniques. Pre: 1114. (1H,4L,3C)

3175-3176: BUILDING SYSTEMS FOR INTERIOR DESIGN
Overview of building systems as they relate to the design of building interiors. Pre: 2044. (3H,3C)

3954: STUDY ABROAD-INTERIOR DESIGN
Variable credit course.

4044: INTERIOR DESIGN V
Exploration and development of interior spaces emphasizing various commercial project types. Pre: 3184, 3044. (1H,12L,6C)

4054: INTERIOR DESIGN VI
Senior Thesis studio requiring research and design of a self-generated project. Pre: 4044. (1H,12L,6C)

4144: ADVANCED COMPUTER-AIDED DESIGN (CAD) STUDIO
Interior design studio with emphasis on computer modeling, rendering, and animation. Pre: 3144. (6L,3C)

4554: CONTEMPORARY ISSUES IN INTERIOR DESIGN
Study of social, economic, political, and technological issues that influence contemporary interior design practice. Pre: 3126. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Architecture & Urban Studies

School of Architecture + Design: Landscape Architecture

http://archdesign.vt.edu/landscape-architecture/

Brian Katen, Program Chair
Professors: B.C. Johnson; P.A. Miller
Associate Professors: D.R. Bork; T.L. Clements; W. Jacobson; B. Katen; P. Kelsch; L. McSherry; M. Kim
Adjunct Professors: David McGill; Caren Yglesias

Overview

Landscape Architecture encompasses the design, analysis, planning, management, and stewardship of sustainable environments. Landscape architects design and engage the landscape across a wide range of project scales including garden, community, urban, metropolitan, and regional, as well as at the scale of watersheds and natural systems. The profession is grounded in the natural and social sciences, draws its inspiration from nature and the arts, and is implemented through site engineering, construction, and land management technologies. The professional curriculum is designed to encourage exploration, creativity and collaboration. Students are educated to be independent thinkers in a program where theoretical and applied approaches to landscape architectural design are emphasized. Students often work with communities addressing real issues on actual sites. The studio sequence culminates in a year-long capstone project developed with a faculty advisor. Students entering the field should have an inquiring mind, a creative bent, and be willing to learn by doing.

The core of the academic program is a rigorous set of design studios that allow students to explore a broad range of landscape architectural issues and project types. Studios are accompanied by a series of lecture, laboratory, discussion, and reading courses that provide systematic and comprehensive coverage of technical information related to landscape architecture, as well as the emerging body of knowledge related to design theory, landscape ecology, and human/environment interaction. Off-campus options include a Europe summer travel studio, study at the Washington Alexandria Architecture Center, approved semester abroad opportunities and professional internships.

The program in landscape architecture (B.L.A.) is a five year first professional degree program that is fully accredited by the Landscape Architecture Accreditation Board of the American Society of Landscape Architects. Graduates can look forward to a wide range of employment and professional opportunities including work in private practice, mutlidisciplinary firms and public agencies and municipalities, as well as non-government organizations and non-profits.

Program Requirements	**H**
Curriculum for Liberal Education:	
Area 1: ENGL 1105, 1106, Freshman English	6
Area 2: Ideas, Cultural Traditions & Values LAR 4034 Evolution of American Landscape	6
Area 3: Society and Human Behavior	6
Area 4: Scientific Reasoning and Discovery	8
Area 5: MATH 1015, 1016: Elem. Calculus with Trig ***or*** MATH 1535, 1536: Geometry and Math of Design	6
Area 6: Creativity and Aesthetic Experience	1
Area 7: Critical Issues in a Global Context	3
The Program Core:	
ARCH 1015, 1016: Foundation Design Laboratory	12
LAR 1004: Natural and Human Systems in Landscape Architecture I	3
LAR 1144: Introduction to Landscape Architecture	1
LAR 2004: History and Theory of Landscape Arch. I	3

LAR 2015, 2016: Basic Landscape Architecture Design	12
LAR 2035: Landscape Arch. Technology I - Grading	4
LAR 2036: Landscape Arch. Technology I - Materials	4
LAR 3004: Natural and Human Systems in Landscape Architecture II	3
LAR 3015, 3016: Intermediate Landscape Design	12
LAR 3044: Land Analysis and Site Planning	3
LAR 4004: History and Theory of Landscape Arch. II	3
LAR 4084: Advanced Land Planning and Design	6-12
LAR 4094: Senior Project	8-12
LAR 4124: Professional Practice	3
LAR 4244: Landscape Architecture Technology II - Hydrology	4
LAR 4304: Topics in Landscape Architecture	3
LAR 4324: Landscape Architecture Technology III - Construct Docs.	4
Additional Requirements:	
Earth Science Cluster	3
Plant Science Cluster	6
Free Electives	18-26
Total Credits	**(157)**

Satisfactory Progress

All students must achieve a minimum 2.00 GPA by the end of the semester in which the 50th credit hour has been attempted. All students must achieve a C- or higher grade in all required landscape architecture design labs and technology courses.

Graduation Requirements

Upon successful completion of program requirements and with completion of 157 credit hours of study, a Bachelor of Landscape Architecture degree is awarded.

Undergraduate Courses (LAR)

1004: NATURAL AND HUMAN SYSTEMS IN LANDSCAPE ARCHITECTURE I An introduction to natural and human structures, patterns and systems in landscapes with emphasis on their relationship to planning and design. (3H,3C)

1015-1016: DESIGN FOUNDATION LABORATORY
Laboratory and seminars in which students and faculty explore the nature of problems with which landscape architecture and the built environment are concerned. Students experimentally develop design methods for structuring concepts and forms that respond to identified issues. Restricted to landscape architecture majors or by consent of instructor. (1H,12L,6C)

1144: INTRODUCTION TO LANDSCAPE ARCHITECTURE
Overview of the profession of landscape architecture. Emphasis on the relation of people to the natural and built environment with particular attention to scale, forms, and space. (1H,1C) I,II.

2004: HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE I
A critical examination of the history and theory relevant to landscape architectural design and built form. Historical precedent with respect to concepts of "form-generation" will be stressed. The course includes an overview of the relationships of landscape architectural history, and design theories and philosophies. (3H,3C)

2015-2016: BASIC LANDSCAPE DESIGN
Basic theory, principles, and methods of landscape design and site planning. 2015: Design theory involving two and three dimensional compositions. Mass/space relationships, principles of spatial design and techniques used to create landscape space. 2016: Design theory relating to landscape design and site planning. Design of small scale spaces in which the analysis of site, context and the requirements of human use are brought together in a creative synthesis. I (1H,11L,6C)

2035-2036: LANDSCAPE ARCHITECTURE TECHNOLOGY I: GRADING AND MATERIALS
2035: Provides an introduction to landscape construction processes, focusing on principles and techniques of landform manipulation for design and drainage purposes. Enrollment limited to Landscape Architecture majors. (2H, 4L, 4C) 2036: Develops concepts, methods and techniques for understanding construction materials and assembly techniques related to Landscape Architecture construction. Methods, concepts, and principles for documenting detailed construction information are also covered, including conventional and digital communication technologies. (3H, 3L, 4C)

2035: (2H,4L,4C) 2036: (3H,3L,4C)

2554 (FOR 2554): NATURE AND AMERICAN VALUES
Introduces students to the evolving relationship between nature and American society; emphasizing the ethics and values which underlie forest, park, and wildlife management. Students are introduced to contemporary land use issues and learn to articulate, defend, and critique the ethical positions surrounding these issues (i.e., wilderness, sustainability, biodiversity, hunting, old growth, suburban sprawl, environmental activism. (3H,3C) I,II.

2984: SPECIAL STUDY
Variable credit course.

3004: NATURAL AND HUMAN SYSTEMS IN LANDSCAPE ARCHITECTURE II
An advanced course examining structures, patterns and systems in landscapes with emphasis on their relationship to landscape architecture planning and design. Application of theories and methods related to human, social, geophysical and biological systems in planning and design. (3H,3C)

3015-3016: INTERMEDIATE LANDSCAPE DESIGN AND CONSTRUCTION DOCUMENTS
This course deals with the development of site planning and design skills and provides a link between landscape architectural design and construction documentation. 3015 focuses on understanding the influence of natural and cultural factors in design, site analysis, design programming, concept development and design development. 3016 integrates site planning and design skills with preparation of landscape architectural construction drawings and technical specifications. Pre: 2035, 2036 for 3015; 3015 for 3016. (2H,10L,6C)

3044: LAND ANALYSIS AND SITE PLANNING
Introduction to the concepts and methods of ecological resource survey and analysis at regional and site scales. Approaches to environmental problem solving with an emphasis on data collection, evaluation, and synthesis using applicable technologies such as geographic information systems. Interpretation of landscape resource data for the purpose of physical planning and design. Pre: 1004. (2H,2L,3C) II.

3524 (HORT 3524): HISTORY OF LANDSCAPE ARCHITECTURE
A study of the design-form and structure of landscape architectural works from the Bronze Age to the present, including the influence of physical, climatological, and social context, and of the individual designers. Junior standing required. I (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

3984: SPECIAL STUDY
Variable credit course.

4004: HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE II
This course studies theoretical and practical developments in landscape architecture and related arts through investigation and analysis of design theory and philosophy, and built form. Pre: 2004 or permission of instructor. I Pre: 2004. (3H,3C)

4034: EVOLUTION OF THE AMERICAN LANDSCAPE
An examination of physical change in the rural and urban landscape of America as reflected by changes in needs during the country's history. Some of the factors influencing the character, form, and use of American space that will be studied are economic growth, changing philosophies on conservation and exploitation of natural resources and the resulting legislation, technological advancement, and social reform. (3H,3C) II.

4084: LANDSCAPE DESIGN AND PLANNING STUDIO
This course is an advanced studio that enables students to address landscape architectural design and planning issues in various contexts and at a range of scales. Pre: 3016 or permission of instructor. Landscape Architecture majors must take minimum of 6 credits. May be repeated to a maximum of 12 credit hours. Pre: 3016. (1H,11L,6C) I,II.

4094: SENIOR PROJECT
A capstone of a five-year design studio sequence, the senior project is a comprehensive landscape architecture design project selected and completed by the student under the direction of a faculty advisor. Senior projects are reviewed and evaluated by the program faculty. Repeatable with a maximum of 12 credits. Variable credit course. X-grade allowed. I,II.

4124 (ARCH 4044): PROFESSIONAL PRACTICE
Introduction to scope and diversity of the building enterprise, addressing private and public macroeconomic, industrial, technical, professional, and regulatory institutions. Analysis of historic evaluation of professional roles and practices; emergence of new modes of practice, including innovative facilities procurement methods. (3H,3C)

4234: THEORY AND PRACTICE OF URBAN DESIGN
This course examines historic and contemporary trends in urban design theory and practice; methods of analyzing urban form; social, cultural, and environmental dimensions of urban design. (3H,3C) II.

4244: LANDSCAPE ARCHITECTURE TECHNOLOGY II: HYDROLOGY
Landscape architecture hydrology examines water resource issues as they relate to landscape planning, site planning and site design. Key topics include estimation of stormwater runoff, stormwater management, watershed planning/flood routing and impact mitigation, design of open channel conveyances, and erosion and sedimentation control. Pre: LAR 2035 and 2036 or consent of instructor. I Pre: 2035, 2036. (2H,4L,4C)

4304: TOPICS IN LANDSCAPE ARCHITECTURE
Topics in landscape architecture history, theory and design methods is an advanced course focusing upon issues facing the professional practice of

landscape architecture today. Special emphasis on methods of analysis and interpretation including application of creative techniques, analogous thinking, computer-aided procedures and information handling in landscape architecture design and practice. Pre: 3015 and 3016 or permission of instructor. May be repeated with different content for a maximum of 12 credits. Pre: (3015, 3016). (3H,3C)

4324: LANDSCAPE ARCHITECTURE TECHNOLOGY III-CONSTRUCTION DOCUMENTS
This course provides the link between landscape architectural design and construction documentation. Landscape technology covered in preceding technology courses is combined with information on construction principles and practices in the preparation of landscape architectural construction drawings and technical specifications. Pre: 4244. (2H,4L,4C) II.

4444: ENVIRONMENTAL IMPACT ASSESSMENT
An examination of the issues, policies and methods related to environmental impact assessment (EIA) as required by the National Environmental Policy Act (NEPA) of 1969. Topics studied include NEPA requirements, historic evolution of legislation and regulations, and methods used to assess ecological, visual, social, and economic impacts. (3H,3C)

4705-4706: LANDSCAPE DESIGN AND PLANNING
Theories, methods, techniques, and tools relating to the planning and design of sites, communities, and regional landscapes. 4705: Emphasis on the development of design ability through the study of: two- and three-dimensional design, principles and elements of spatial composition, and theories and techniques for planning and design of small sites. 4706: Emphasis on the evaluation of land resources and the allocation of land uses within large complex sites and regional landscapes. Theories and techniques of site planning and community design are explored. (1H,8L,5C) I,II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

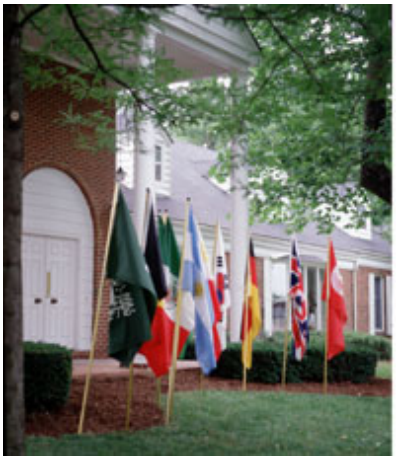
TOP

College of Architecture & Urban Studies

School of Public and International Affairs

www.spia.vt.edu/

J. Randolph, Director
Executive Committee: L.S. Dudley; T.W. Luke; J. Randolph; J. Richardson



Overview

The School of Public and International Affairs (SPIA) provides students interested in public issues with opportunities to gain perspectives and skills from several related disciplines. SPIA is a school within the College of Architecture and Urban Studies and is made up of the Center for Public Administration and Policy, the Government and International Affairs Program, and the Urban Affairs and Planning Program. Undergraduate degrees are offered by Urban Affairs and Planning – a B.S. in Environmental Policy and Planning and a B.A. in Public and Urban Affairs (see Urban Affairs and Planning in this catalog). In addition, SPIA-affiliated departments in other colleges (Geography in Natural Resources; Political Science, International Studies, and Science and Technology in Society in Liberal Arts and Human Sciences; Agricultural and Applied Economics in Agriculture and Life Sciences) offer selected SPIA undergraduate concentrations in urbanization: planning and policy, global development, environmental affairs, public and nonprofit management, and public policy.

SPIA sponsors the Washington Semester, a ten-week, twelve-credit-hour summer program that allows undergraduate students to combine Washington, D.C.-area internships with course work for academic credit. For more information about undergraduate degree programs, students should contact Urban Affairs and Planning; for information on the various concentrations, students should contact the main office of any of the affiliated departments. Information on graduate programs may be obtained from the Center for Public Administration and Policy, Government and International Affairs, and Urban Affairs and Planning.

Undergraduate Course Description (SPIA)

1004 (PSCI 1004): NATIONS AND NATIONALITIES
Introduction to world and American ethnic and indigenous cultures and to social constructions of human and group identity, nationalism and extreme ethno-nationalism. Music, dance, film, art, ceremonial rituals and other multimedia forms of creative or symbolic expression, supplement readings and lectures. Multidisciplinary exploration of collective conceptions of cultural differences.
(3H,3C)

College of Architecture & Urban Studies

Urban Affairs and Planning (School of Public and International Affairs)

www.uap.vt.edu/

University Exemplary Department
Jesse J. Richardson, Chair
University Distinguished Professor: P. L. Knox
Professors: J. R. Bohland; J.O. Browder; C. T. Koebel; A. C. Nelson; J. Randolph
Associate Professors: A. Ebrahim; R. E. Lang; J. Richardson; M. Stephenson; K. Wernstedt; D. Zahm
Assistant Professors: E. Nance; C. Dawkins; B. Goldstein; S. Hirt; H. Mayer
Adjunct Professors: M. E. Ridenour; A. Steiss

Overview

The Urban Affairs and Planning Program (UAP) offers two undergraduate degrees, the B.A. in public and urban affairs and the B.S. in environmental policy and planning, as well as minors under both degrees. At the graduate level the department offers the master of urban and regional planning degree.

B.A. in Public and Urban Affairs

The B.A. in public and urban affairs (PUA) is an interdisciplinary social science degree with a professional cast. It aims to educate students in the liberal arts tradition while equipping them with the skills, knowledge, and analytical thinking used in planning and policy. Students learn to address the political, economic, environmental, social, and governmental consequences of growth and change and to help resolve the problems that emanate from them.

The 120 credit hour curriculum in public and urban affairs includes 36 hours in the Curriculum for Liberal Education, 36 hours in the major core, 18 hours in one of five areas of concentration and 30 hours of free electives.

Curriculum for Liberal Education Requirements (36 hours)
Area 1: ENGL 1105-1106 Freshman English
Area 2: 3 hours from approved list, plus PHIL 3314 Ethics ***or*** PHIL 1304 Morality and Justice ***or*** PHIL 2304 Global Ethics
Area 3: ECON 2005-2006 Principles of Economics
Area 4: 8 hours in any approved science lecture/lab sequence
Area 5: MATH 1015-1016 Elementary Calculus with Trigonometry
Area 6: LAR 1144 Introduction to Landscape Architecture
Area 7: UAP 3344 Global Environmental Issues
Major Core Requirements (39 hours)
UAP 1024 Public Issues in an Urban Society
UAP 3074 Social Movements in Urban Society ***or*** SPIA 1004 Nations and Nationalities
PSCI 1014 Introduction to United States Government and Politics

PSCI 2055 World Politics and Economy
UAP 3014 Urban Policy and Planning
UAP 3714 U.S. Policy Process
UAP 4714 Economics and Financing of State and Local Government
UAP 4754 Legal Foundations of Planning
UAP 3004 Urban Research Methods ***or*** PSCI 2024 Research Methods in Political Science
UAP 3744 Public Policy Analysis
UAP 4184 Community Involvement
STAT 3604 Statistics for the Social Sciences
UAP 4914 Senior Seminar in Public and Urban Affairs
15 hours from an approved list in one of five concentration areas:
Urbanization: Planning and Policy
or Public and Non-Profit Management
or Public Policy
or Global Development
or Environmental Affairs
30 hours free electives

Satisfactory Progress

Satisfactory progress toward the public and urban affairs degree requires successful completion of PSCI 1014, PSCI 2055, UAP 3014, UAP 3004, and UAP 3344 by the time 72 total hours have been attempted. Minimum overall and in-major GPA 2.0. In-major GPA includes 39 hours in the PUA major core, 15 hours in the PUA concentration, and ECON 2005-2006 and UAP 3344 in the Curriculum for Liberal Education.

Minor in Public and Urban Affairs

A minor in Public and Urban Affairs requires completion of 18 credit hours:
UAP 1024: Public Issues in Urban Society
UAP 3014: Urban Policy and Planning
12 hours from approved list of UAP courses

B.S. in Environmental Policy and Planning

The B.S. in environmental policy and planning (EPP) provides students the opportunity to study environmental problems and their solutions from an interdisciplinary perspective involving humanities, natural and social science, planning, and public policy. While rooted in scientific and technological fields, environmental problems and their solutions increasingly deal with public values, economics, law, policy, and planning. The EPP curriculum, while providing a broad liberal arts and natural and social science base, has a pre-professional slant involving analytical and communication skills and policy and planning methods to prepare students for employment and graduate study.

Curriculum for Liberal Education Requirements (36 hours)
Area 1: ENGL 1105-1106 Freshman English
Area 2: 3 hours from approved list, and either LAR 4034 Evolution of the American Landscape ***or*** FOR 2554 Nature and American Values ***or*** UAP 4264 Environmental Ethics and Policy
Area 3: ECON 2005-2006 Principles of Economics ***or*** AAEC 1005-1006 Economics of Food and Fiber
Area 4: BIOL 1005-1006/1015-1016 General Biology and Lab ***or*** BIOL 1105-1106/1115-1116 Principles of Biology and Lab
Area 5: MATH 1015-1016 Elementary Calculus with Trigonometry
Area 6: LAR 1144 Introduction to Landscape Architecture
Area 7: UAP 3344 Global Environmental Issues
Environmental Policy and Planning Requirements (61 hours)
PSCI 1014 Introduction to US Government & Politics

UAP 3714 US Policy Process
UAP 3744 Public Policy Analysis
AAEC 3314 Environmental Law
UAP 3354 Introduction to Environmental Policy and Planning
UAP 4354 Environmental Problem Solving Studio
UAP 4364 Seminar in Environmental Policy and Planning
UAP 4184 Community Involvement
UAP 4374 Land Use and Environment
UAP 4384 Pollution Control Planning and Policy
UAP 3024 The Personal Computer in Urban Analysis ***or*** GEOG 4084 Intro to GIS ***or*** SPIA 2004 Computer Applications in Social Science Research
STAT 3604 Statistics for the Social Sciences
COMM 2004 Public Speaking ***or*** ENGL 3764 Technical Writing
ECON 4014 Environmental Economics **or** AAEC 4304 Environmental and Sustainable Development Economics
CHEM 1015/1025 Intro to Chemistry and Lab **or** CHEM 1035/1045 General Chemistry and Lab
ENSC 3604/CSES 3604 Fundamentals of Environmental Science
One of the following: ENGR 3054 Engineering Our Environment **or** ENGR 3124 Intro to Green Engineering **or** UAP 4394 Community Renewable Energy Systems
One of the following: BIOL 2804 Ecology **or** BSE 2384 Soil and Water Resources Management **or** GEOG 1104 Intro to Physical Geography **or** GEOL 1004 Physical Geology **or** FOR 2314/2324 Dendrology and Lab **or** FIW 2114 Principles of Fisheries and Wildlife Management **or** CSES 3114 Soils
Two of the following: **or** UAP 4214 Women, Environment, Development **or** UAP 4344 Law of Critical Environmental Areas **or** AAEC 4314 Environmental Economic Analysis and Management **or** AAEC 4344 Sustainable Development Economics **or** HIST 3144 American Environmental History **or** LAR 4444 Environmental Impact Assessment
Free Electives (23 hours)

Satisfactory Progress

Satisfactory progress toward the degree requires successful completion of UAP 3344, UAP 3354, CHEM 1015 (or CHEM 1035), and PSCI 1014 by the time 72 total hours have been attempted. Minimum overall and in-major GPA 2.0. In-major GPA includes all courses in the EPP curriculum plus BIOL 1005-1006 (or BIOL 1105-1106), and ECON 2005-2006 (or AAEC 1005-1006), and LAR 4034 (or FOR 2554 or UAP 4264), and UAP 3344 in the Curriculum for Liberal Education.

Minor in Environmental Policy and Planning

Environmental Values, History, Ethics: **(3 hours--one course--from the following)**
HIST 3144: American Environmental History
or LAR 4034: Evolution of the American Landscape
or FOR 2554: Wilderness, Parks, and American Life
or UAP 4264: Environmental Ethics and Policy
Environmental Science: **(6 hours from the following)**

UAP 3354: Intro. to Environmental Policy & Planning
ENSC 3604: Fundamentals of Environmental Science **or** CSES 3604: Fundamentals of Environmental Science
Environmental Policy and Planning: **(9 hours)**
9 hours from:
UAP 3344: Global Environmental Issues
UAP 4184: Community Involvement
UAP 4344: Law of Critical Environmental Areas
UAP 4374: Land Use & Environment: Plan. & Policy
UAP 4384: Pollution Control: Planning and Policy
Env. Policy & Planning Applications: **(2-4 hours from the following)**
UAP 4354: Environmental Problem Solving Studio **or** UAP 4364: Seminar in Environmental Policy & Planning

Undergraduate Course Descriptions (UAP)

1024: PUBLIC ISSUES IN AN URBAN SOCIETY
This class introduces some of the most vital concerns and issues challenging democratic capitalistic urban societies today. Topics addressed include different perspectives on the causes and portent of the urban underclass, the growing inequality between the educated and less well educated in the nation's labor markets, the causes of the marked resegregation of many of the nation's urban centers by race and income and the implications of privatization and interjurisdictional competition for the public policy behavior and outcomes of subnational governments. (3H,3C) I,II.

2014: URBANIZATION AND DEVELOPMENT
Relationships between urbanization and economic development; role of cities in social, political, cultural, and economic development of societies; cities as settings for innovation and change. (3H,3C)

2024: WORLD CITIES
A comparative approach to urban systems, urban form, and urban living throughout the world. The role of cities in national and international economics. The form of urban development in relation to political, economic, and cultural context. Comparisons of urban problems and policy responses. (3H,3C)

2114: INTRODUCTION TO COMMUNITY AND ECONOMIC DEVELOPMENT
Acquaints students with basic concepts and principles of community and economic development, primarily as practiced in the United States but with comparative international approaches and examples. Explores programs and policies, commonly used implementation tools, and the consequences of alternative policy choices. Pre: 1024. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

3014: URBAN POLICY AND PLANNING
An introduction to urban policy and urban planning. Includes analysis of the basic concepts and principles of urban policy, a review of urban policy in the United States, discussion of the development of urban planning and its role in shaping the urban environment, and an analysis of the relationship between public policy and planning and the organization and structure of the urban environment. Must complete prerequisite UAP 1024 with a B- grade or higher. Pre: 1024. (3H,3C)

3024: URBAN AND REGIONAL ANALYSIS
Overview and application of various methods used to study, represent, understand communities in their urban and regional context. Data collection and analysis; population, land use, transportation and economic forecasting; selecting and applying an appropriate method; designing and presenting a community study. Restricted to majors and minors only. (3H,3C)

3064: URBAN DIVERSITY
Examines the growing diversity of the metropolitan population in the United States including the rising numbers of people of color, the disabled, the growth of single person and single-parent headed households, aging and sexual orientation. Introduces issues and problem solving techniques related to managing city and suburban areas as they adjust to diversity. Junior standing required. I (3H,3C)

3224: POLICY IMPLEMENTATION
Systematic analysis of the field and practice of public policy implementation. Includes analysis of the structure and dynamics of the policy process as well as specific analytic approaches to understanding policy implementation. Includes analysis of intra-organizational, interorganizational and intergovernmental implementation processes. Must complete prerequisites UAP 3014 and UAP 3024 with B- grade or higher. Pre: 3014, 3024. (3H,3C)

3264: CONTEMPORARY URBAN ISSUES
Consideration of one particular issue of immediate importance to the contemporary urban environment. Topics emphasize major social or economic policy issues, and may change each year. Junior standing required. (3H,3C)

3344 (PSCI 3344): GLOBAL ENVIRONMENTAL ISSUES: INTERDISCIPLINARY PERSPECTIVES
Critical examination of major global environmental problems (e.g., global warming, atmospheric ozone depletion, acid rain, tropical deforestation, toxic

waste) with emphasis on their social, economic, political, ethical, and policy implications and solutions. Completion of Area 4 of University Core required. (3H,3C) II.

3354: INTRODUCTION TO ENVIRONMENTAL POLICY AND PLANNING
Introduction to the interdisciplinary principles of environmental policy, planning, economics, and ethics to address pollution abatement, resources conservation, habitat protection, and environmental restoration. The course will focus on practical means of identifying environmental problems and creatively solving them. (3H,3C) I,II.

3434 (PSCI 3414): PUBLIC ADMINISTRATION
The role and context of public administration in the contemporary United States, administrative organization and decision-making, public finance, human resources administration, and program implementation. Pre: PSCI 1014. (3H,3C)

3444 (PSCI 3444): ADMINISTRATIVE LAW AND POLICY
The legal context of the exercise of discretion by public administrators in the United States. Adjudication and rule- making; access to administrative processes and information; legislative and judicial control of administration. Pre: PSCI 1014. (3H,3C)

3464 (AHRM 3464) (EDHL 3464) (GEOG 3464) (HD 3464) (HUM 3464) (SOC 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. 2000-level course in any cross-listing department required. (2H,3L,3C)

3604: PUBLIC BUDGETING
Examines principal theories, concepts and practices of budgeting as practiced in the public sector in the United States. Assesses evolution of budgetary theory and practice from perspective of effective policy making, managerial needs, analytical techniques and reporting requirements. Junior standing required. (3H,3C)

3714 (PSCI 3714): THE U S POLICY PROCESS
Description and analysis of the processes and institutions involved in the making and implementation of public policy in the United States, with a primary focus on domestic and economic policy. Empirical and normative models of the process of public policy making in the U.S. I Pre: PSCI 1014. (3H,3C)

3744 (PSCI 3744): PUBLIC POLICY ANALYSIS
Methods and approaches used in the analysis and evaluation of public policy; strengths and limitations of various analytic tools; normative issues in the practice of policy analysis. (3H,3C) II.

3774 (PSCI 3774): MARXIAN POLITICAL ANALYSIS
Contemporary uses of Marxian concepts and theories to study the world economy, business structure, current social issues, modern ethical values, and alienation. Pre: 1024. (3H,3C) II.

3894: URBAN POVERTY, WORKFORCE DEVELOPMENT AND PUBLIC POLICY
Examines urban labor markets and related problems, low-skill workers, unemployment and underemployment, new directions in workforce development, policy initiatives and private interventions and their outcomes for disadvantaged populations. Pre: ECON 2005. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4184: COMMUNITY INVOLVEMENT
Issues, concepts, and techniques of citizen participation in community development. Institutional frameworks and their historical precedents. Exercises developing group communications skills, public meeting facilitation, and design of community involvement programs. (3H,3C)

4214 (WS 4214): WOMEN, ENVIRONMENT AND DEVELOPMENT IN A GLOBAL PERSPECTIVE
Explores intersecting roles of gender, culture, and socio-economic status in people's use of nature, management of environmental resources, and experiences of environmental change. Examines debates on environmental and development initiatives, environmental ethics, and environmental social movements from feminist perspectives. Pre: 3344 or 3354.
(3H,3C) II.

4224: POLICY-MAKING IN THE FEDERAL SYSTEM
This course analyzes both the design and structure of our nation's intergovernmental framework. The class examines alternative understandings of the intentions of the Founders and of the changing roles of the courts, Congress, the presidency, the governorship, the state legislatures, local governments and other institutional actors in our intergovernmental system. The class emphasizes both the strengths and weaknesses of our multi-layered system of governance laying special stress on its implications for policy process effectiveness, efficiency and accountability. (3H,3C) II.

4264: ENVIRONMENTAL ETHICS AND POLICY
Issues in applied environmental ethics. Contributions of diverse religious and philosophical traditions to contemporary perspectives on the human-nature relationship. Examination of environmental policies from utilitarian economic, deep ecology, and ecofeminist perspectives. Junior, senior or graduate standing required. Pre: 3344 or 3354. (3H,3C) II.

4344: LAW OF CRITICAL ENVIRONMENTAL AREAS
This course examines the legal principles and policy debates involved in the regulation and protection of critical environmental resources. Specific topics vary but will likely include wetlands law and policy, endangered species habitat, open space, forestland and farmland protection, costal zone management, and floodplain regulation and policy. Pre: 4754, AAEC 3314. (3H,3C)

4354: INTERDISCIPLINARY ENVIRONMENTAL PROBLEM SOLVING STUDIO

Interdisciplinary, experiential problem solving studio focusing on specific environmental problems. Working in groups, students interact with local officials, consultants, developers, environmental groups to explore the processes of environmental management, regulation and mitigation, applying techniques and skills frequently used by environmental planners and policy-makers. Senior status required and 9 credit hours, 3000-level or above, in the Environmental Policy and Planning major or minor; Pre: 3354. (2H,5L,4C) II.

4364: SEMINAR IN ENVIRONMENTAL POLICY AND PLANNING
Critical examination of the social, political, economic, legal, scientific, and technological contexts underlying processes of environmental change, problems, and solutions, as seen from various conceptual and disciplinary perspectives. Senior status required and 9 credit hours, 3000-level or above, in the Environmental Policy and Planning major or minor. Pre: 3354. (2H,2C) I,II.

4374: LAND USE AND ENVIRONMENT: PLANNING AND POLICY
Environmental factors involved in land use planning and development, including topography, soils, geologic hazards, flooding and stormwater management, ecological features, and visual quality. Techniques used in conducting environmental land inventories and land suitability analyses. Policies and programs to protect environmental quality in land use planning and development. (3H,3C)

4384: POLLUTION CONTROL PLANNING AND POLICY
Planning and policy aspects of managing residuals and environmental contaminants and their effects on human health and environmental quality. Technical and economic factors involved in management of water quality, air quality, solid and hazardous wastes, toxic substances, and noise. Implementation of pollution control legislation, policies, and programs at federal, state, and local levels.
(3H,3C)

4394: COMMUNITY RENEWABLE ENERGY SYSTEMS
Practical design fundamentals for small scale renewable energy systems: solar building heating and cooling; solar domestic hot water; wind, photovoltaic, and hydroelectric systems; alcohol, methane and other biomass conversion systems. Developing plans, programs, and policies to stimulate development of renewable systems. (3H,3C)

4404 (ALS 4404) (GEOG 4404) (NR 4404): APPROACHES TO INTERNATIONAL DEVELOPMENT
An introduction to issues relating to international development. The course will focus on areas to help students better understand the interdependencies between countries and how institutions and organizations can foster effective working relationships on global projects of mutual interest between countries. (1H,1C) I.

4614: HEALTH POLICY
Inquiry into the structure of contemporary health policy and its historic antecedents, into the impacts of public policy on health status and health care delivery, into policy strategies for controlling health costs, and into the political economy of health and its influence on health policy formation. Emphasis is on the U.S. health system but that experience is placed in context by consideration of case studies of other advanced capitalist nations. I Pre: 3224. (3H,3C)

4624 (PSCI 4624): THE WASHINGTON SEMESTER: SEMINAR IN AMERICAN POLITICS AND PUBLIC POLICY
This seminar is the integrative forum for the principal elements of the Washington Semester experience. The course explores both the role of political institutions in policy formation and implementation and the primary managerial and leadership challenges that arise for implementing organization managers in American democratic public policy-making. Junior standing required and acceptance into the Washington Semester program. X-grade allowed. (3H,3C) III,IV.

4624H (PSCI 4624H): HONORS THE WASHINGTON SEMESTER: SEM IN AMERICAN POLITICA AND PUBLIC POLICY
X-grade allowed. (3H,3C)

4644 (PSCI 4644): THE WASHINGTON SEMESTER: POLITICS, POLICY AND ADMINISTRATION IN A DEMOCRACY
This course is part of the Washington Semester. Explores the relationship between the imperatives of democratic mobilization, policy choices and organizational choices through intensive study of the operating context of a selected public or nonprofit organization. Examines implications of policy-maker choices for implementing institution dynamics and challenges. Junior standing and acceptance into the Washington Semester program. X-grade allowed. Pre: PSCI 3714. (3H,3C) III,IV.

4644H (PSCI 4644H): HONORS THE WASHINGTON SEMESTER: POLITICS, POLICY AND ADMIN IN A DEMOCRACY
X-grade allowed. (3H,3C)

4654 (ARCH 4654): URBANIZATION AND URBANISM IN EUROPE
This course is designed to provide an introduction to European urbanization for students who intend to pursue a study abroad program in Europe, or who have already done so. The course adopts a comparative approach to cities, urban form and urban living, and an understanding of urbanization processes, including urban design and planning, in different parts of Europe. Pre: 2014 or ARCH 2016. (3H,3C)

4714: ECONOMICS AND FINANCING OF STATE AND LOCAL GOVERNMENTS
Examines the provision and financing of public goods and services in local governments. Analyzes associated policy issues. Reviews experience in Western Europe and developing countries, as well as in the United States. Must complete prerequisites UAP 3024 with B- grade or higher, and ECON 2005 and 2006 with C grade or higher. Pre: 3024, (ECON 2005 or ECON 2005H), (ECON 2006 or ECON 2006H). (3H,3C)

4724: CAPITAL BUDGETING AND STRATEGIC FACILITIES PLANNING
Examines the principles and practice of capital budgeting as a primary instrument for the effectuation of long-range public policy objectives. Capital budgeting forms a critical bridge between strategic planning and the delivery of vital public services. Strategic facilities are public improvements that have a relatively long life, involve substantial investment of public resources, and yield fixed assets for the community or organization. (3H,3C)

4744: PRINCIPLES OF REAL ESTATE
Examines the relationship between the real estate market and urban development. Focuses on the private sector real estate market and how it

responds to and shapes urban policy and urban planning practices. (4H,4C)

4754: LEGAL FOUNDATIONS OF PLANNING
Examination of the legal context in which urban planning and public policy operate. Legal structure, role of law, powers of sovereign governments, constitutional limitations on government activities, and public-private conflict and their influence on planning and public policy are examined. (3H,3C)

4764 (GEOG 4764) (SOC 4764): INTERNATIONAL DEVELOPMENT POLICY AND PLANNING
Examination of major development theories and contemporary issues and characteristics of low-income societies (industrialization, urbanization, migration, rural poverty, hunger, foreign trade, and debt) that establish contexts for development planning and policy-making. Junior standing required. I (3H,3C)

4854: PLANNING OF THE URBAN INFRASTRUCTURE
Course examines the interdependences among the elements of the built environment of the city and those between the elements of the built environment and the policy/planning structure of the city. Considered are those elements associated with the primary urban activities (residential, commercial, industrial) as well as the urban form-giving infrastructure facilities that support those land uses
(water supply, sewerage, solid waste disposal, transportation, education, recreation, health, and safety). Pre: 3014. (3H,3C)

4914: SEMINAR IN PUBLIC AND URBAN AFFAIRS
This capstone seminar explores the central questions of the role of the citizen and the citizenry in democratic capitalistic urban societies as well as the nature of accountability in such regimes. Topics such as the processes by which representation occurs, alternate theories of democratic community and the relationship of the public, private and civil sectors in urban society are treated. Senior status in PUA required. PUA majors and minors must complete this course with a C grade or higher to graduate; otherwise course must be repeated.
Pre: 3224, 4714, 4754. (3H,3C)

4964: FIELD STUDY
Variable credit course. X-grade allowed.

4964H: HONORS FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
I
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
I
Variable credit course.

TOP

College of Engineering

www.eng.vt.edu

Richard C. Benson, Dean
Associate Dean for Academic Affairs: Bevlee A. Watford
Associate Dean for Administration, and Chief of Staff: Edward L. Nelson
Associate Dean for International Programs and Information Technology: Glenda R. Scales
Associate Dean for Research and Graduate Studies: Donald L. Leo

Mission of the College

Virginia Tech is the home of the commonwealth's leading College of Engineering. It is known in Virginia and throughout the nation for the excellence of its programs in engineering education, research, and public service. It is the state's largest engineering college, and eighth largest nationally for undergraduate degrees awarded.

The mission of the College of Engineering is to offer high quality support for our stakeholders in order to provide a successful experience in the engineering education pursuits of our customers. The vision of the college is to foster strong working relationships between faculty, student and industry partners that will ultimately bring research opportunities through engineering educational offerings. The goals of the college are to attract high-caliber students and to provide them with a top-quality engineering education in preparation for productive careers; to invest in faculty development to enhance Virginia Tech's reputation as a research university and a leader in graduate education; and to forge new links with industry and government to facilitate economic development within the Commonwealth and the nation.

In U.S. News & World Report's "America's Best Colleges 2009" survey, the College of Engineering's undergraduate program again ranked 14th among all accredited engineering schools. Two undergraduate engineering programs rated among the top 10: aerospace engineering at 10th and industrial engineering at 6th. On the graduate school level, the college ranked 27th among all schools of engineering, with four departments finishing in the top 10 of their respective category. The National Science Foundation placed the college 11th in the nation among the hundreds of engineering colleges for research expenditures.

The College of Engineering offers bachelor of science degrees in the following areas: Aerospace Engineering, Biological Systems Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Construction Engineering and Management, Electrical Engineering, Engineering Science and Mechanics, Industrial and Systems Engineering, Materials Science and Engineering, Mechanical Engineering, Mining Engineering and Ocean Engineering. All other College of Engineering undergraduate programs in engineering are accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700. The Computer Science program is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

Engineers play an important role in modern society. They design and develop new and better materials, products and processes for households and industries, from tiny semiconductors to huge dams. Engineers are needed across a broad spectrum of industry from the traditional field such as mechanical to the emerging fields of robotics and biomedicine. Engineers must not only satisfy society's demand for improved performance, reliability and safety of products, they also are expected to supply solutions for environmental and social problems

created by new technology.

Men and women trained in engineering will find many professional outlets. They may join large or small manufacturing industries or they may offer their skills and knowledge as professional consultants. They may work in government or private research laboratories or teach and do research in universities. If the future leads them into other professions (medicine, law or business), their engineering education will provide a sound base. Graduates of the College of Engineering are in high demand. Our student-run Engineering EXPO attracted more than 270 employers in 2008, and we are a key recruiting school for more than 40 major corporations.

It is essential that engineers, regardless of specialty, be well versed in mathematics, the physical sciences and the engineering sciences so that they can adapt readily to meet the profession's ever-changing demands. But professional training is not enough. Engineers need to have imagination and insight. They must understand the history and traditions of the society in which they live. They also must be broadly familiar with the social sciences and humanities. Last, but not least, engineers must be able to communicate effectively with higher management and the general public. All departments within the college are implementing programs to ensure that every graduate is able to effectively use a variety of spoken, visual and written communication strategies which are necessary for success as a student, for employment, and for life as a responsible citizen. Additional emphasis is being placed in freshmen engineering classes to emphasize the importance of communications in engineering analysis and design. Engineers who are well educated, not just well trained, will be better equipped to develop scientific knowledge into useful technology.

Innovations of the College of Engineering

In a move recognized by the National Academy of Engineering for its leadership, the College transformed its Engineering Fundamentals program into the Department of Engineering Education. While Engineering Education will continue to train freshmen in the fundamental principles of engineering, that curriculum has been broadened to accommodate the Department of Computer Science within the College. The basic ideas and principles inherent in the freshman year — such as the scientific method, an introduction to design, an understanding of the engineer's or technologist's role and responsibility in modern society, and a first exposure to technical communication — can be imparted in both an "analog" and a "digital" environment. Engineering Education also has developed M.S. and Ph.D. programs to prepare students to teach engineering or technology at any level, from kindergarten to college. The National Science Foundation has supported these developments through several major grants.

Tenured or tenure track faculty teach more than 90 percent of all engineering courses at Virginia Tech. Engineering faculty members focus on solving real world problems, and share these experiences in the classroom. The work of the faculty with industry brings modern, up to date knowledge back to the classroom quicker than any textbook. These experiences provide a hands-on dimension that result in the superlative quality of engineering teaching for which Virginia Tech is so well known.

Virginia Tech engineering undergraduates are fortunate to have a combination of excellent classroom instruction and the opportunity to participate in "hands-on, minds-on" engineering training. Two unique facilities, established by the generosity of College of Engineering alumni, are available to undergraduates. In the Joseph F. Ware, Jr. Advanced Engineering Laboratory, students design and construct competition projects including Formula SAE race cars, Baja SAE vehicles, human-powered submarines and airplanes, radio-controlled aircraft, steel bridges, autonomous aerial and underwater vehicles, and hybrid electric vehicles. In the Frith Freshman Engineering Design Laboratory, freshmen learn engineering principles by working with a number of mechanisms donated by industry sponsors.

The Virginia Tech Institute for Critical Technology and Applied Science (ICTAS) has emerged as a vital vehicle that presents a strong link to economic development for the entire Commonwealth. Led by Virginia Tech's College of Engineering, ICTAS presents a case for advancement of humankind through collaborative research, and it represents a strong link between all of the colleges of engineering across the Commonwealth. For the undergraduate, ICTAS will provide opportunities for research employment.

ICTAS incorporates the common features of Organized Research Units (ORUs) that have produced strong economic growth around highly ranked universities. At Virginia Tech, we recognize that a university-affiliated ORU is more than a traditional research center. It must allow for, and encourage, a seamless path from fundamental research, through applied research and development, to technology transfer - not only by publications but also through the licensing of intellectual property, the initiation of new companies, student involvement, and technical assistance to Virginia companies. At Virginia Tech, the common features emerged for the ORUs of ICTAS include: the clustering of synergistic research groups; teaming of researchers with science and engineering backgrounds; a breadth of activities that bridges periods of transition in research emphasis; the employment of full-time researchers and support personnel but with strong linkages to academic units through faculty and student involvement; and an initial investment and financial structure that allows the research unit to become not only self-sustaining but a provider of revenue to the university.

In 2007 ICTAS dedicated its first building, the Nanoscale Characterization and Fabrication Lab. Located in Virginia Tech's Corporate Research Center, the lab is a 32,000 square-foot facility on par with the best nanotechnology labs in the world. In March 2009, the ICTAS-I building opened in the College of Engineering corridor along Stanger and Old turner streets. The 99,000-square-foot building now serves as the institute's home base, housing the School of Biomedical Engineering and Sciences as a principal tenant, in addition to the Sustainable Water Infrastructure Management program head by faculty members Marc Edwards and Sunil Sinha.

Approved by the Virginia General Assembly, the ICTAS-II building soon will be constructed in the university's life sciences corridor to house research labs with a biotechnology focus. The three facilities will provide a total of 200,000 square feet of additional space for College of Engineering researchers and colleagues from the colleges of Science, Natural Resources, and Veterinary Medicine.

Work also is moving ahead on the planned Signature Building. To be located near the corner of Stanger Street and Pepper's Ferry Road, the facility will house many of the College's core departments and serve as a leading center of engineering education in Virginia.

It always has been the philosophy of Virginia Tech's College of Engineering to get the right technology in the hands of our students. This reasoning fostered our pioneering decision in 1984 to become the first large public university to require our entering engineering freshmen to purchase a PC. In 2002, the College of Engineering switched the requirement to a Notebook computer. In 2006, in order to provide the opportunity for our engineering students to continue their education at the cutting edge of technology, we moved to the Convertible Tablet PC. Use of this device in and outside of class provides our students with experiences that they will use in the future.

The Convertible Tablet PC allows students to use digital ink for taking notes, drawing diagrams as part of the notes or homework assignments; annotating faculty PowerPoint slides or other electronic files and easily writing mathematical equations. Additionally, students are able to use digital-ink enabled collaboration software to support learning activities in and outside of class. By having all of their information electronically in one place, students have a tool to support them with organizing their assignments and time as well as collaborating electronically with their peers.

The Tablets are used in engineering classes and incoming freshmen use their Tablets in their first year courses, such as EngE 1024, 1104 and 1114, as well as in many upper division classes. Formerly a "computer requirement," this now is a "technology requirement." We group the computer, software and any other tools necessary as part of an integrated requirement. Through this program we know that the students will benefit from their experience.

The Myers-Lawson School of Construction further enhances Virginia Tech's recognized strong position of national leadership in construction education and research. The primary focus of the Myers-Lawson school is on values-based leadership in the construction industry. The school combines the strengths of two excellent programs - the Department of Building Construction in the College of Architecture, and the Vecellio Construction Engineering Management Program in the Via Department of Civil and Environmental Engineering in the College of Engineering - to establish a new standard for construction education and research.

The School of Construction provides undergraduates and graduates more choices for pursuing construction education. It is anticipated that the undergraduate degree in construction engineering and management will complement the existing degree programs in building construction and in civil and environmental engineering. The school will work with faculty from multiple departments to provide students with additional opportunities to pursue concentrations, minors, or support courses related to construction. The Myers-Lawson School and the Department of Building Construction is located at Bishop-Favro Hall, a 31,600-square-foot building that provides classroom space, seminar rooms, and studios for students. The facility also houses state-of-the-art laboratory spaces, include testing labs, wet labs, material handling, tool and welding labs, and workshops for assembly of construction systems.

Green Engineering

Virginia Tech was one of the first universities to formally consider the connection between engineering practice and environmental stewardship from an interdisciplinary perspective. The Green Engineering Program was created in 1995 and serves all departments within the College of Engineering.

This program combines environmentally conscious attitudes, values, and principles with science, technology, and engineering practice, and focuses this interdisciplinary approach toward improving local and global environmental quality. Based on engineering fundamentals, green engineering analyzes the design of products, processes, and systems to minimize the life cycle environmental impacts, from the initial extraction of raw materials to the energy consumption and waste production during manufacturing to the ultimate disposal of materials that cannot be reused or recycled.

The Green Engineering Program works with students, faculty, and the university administration to provide educational and research opportunities with regard to both the environmental impacts and the environmental solutions that can result from engineering practice.

A university-recognized minor allows interested students to obtain a minor in Green Engineering in addition to their primary degree(s) in the College of Engineering. To obtain this minor, students are required to take 18 credit hours in the minor area as follows: 6 credits in the two core courses – Introduction to Green Engineering and Environmental Life Cycle Analysis; 6 credits in interdisciplinary elective courses; and 6 credits in disciplinary electives within the students' major. Detailed lists of the courses which meet the minor requirements can be found in the Green Engineering Web site at www.eng.vt.edu/green.

Examples of Accomplishments at the National Level

A student team from of the College of Engineering's Robotics & Mechanisms Laboratory (RoMeLa) won the grand prize at the 2008 International Capstone Design Fair in South Korea with a trio of pole-climbing serpentine robots. The team scored the cash prize of 1 million won – the currency of South Korea -- with its robots, the HyDRAS-Ascent (Hyper-redundant Discrete Robotic Articulated Serpentine for climbing), the HyDRAS-Ascent II and CIRCA (Climbing Inspection Robot with Compressed Air), at the 2008 International Symposium on Educational Excellence 2008 competition. The autonomous robots are designed to climb scaffolding and buildings by wrapping around a poll or beam and then rolling upward via an oscillating joint motion. Using built-in sensors and cameras, the robots would then inspect the structures or handle other dangerous tasks now done by human.

The *Engineers' Forum*, a magazine produced quarterly by Virginia Tech students on issues relating to the College of Engineering, announced a $100,000 gift to the University's Education Foundation. The gift will be divided into two funds that will be used to provide scholarship money

to officers of the magazine on a permanent basis. In 2001, the *Engineers' Forum* created its initial endowment. That first endowment directs scholarship money of $500 per semester to the editor-in-chief of the magazine.

A student team, consisting of undergraduate and graduate students within the materials science and engineering (MSE) department, created a new, highly durable brick tha tone day could be used to help build moon colonies. The bricks won the 2008 In-Situ Lunar Resource Utilization materials and construction category award from the Pacific International Space Center for Exploration Systems (PISCES). The award was one of two prizes given out this year by the research center, which is dedicated to supporting life on the moon and beyond. Initially designed to construct a dome, the building material is composed of a lunar rock-like material mixed with powdered aluminum moldable into any shape. Design work on the early-development lunar bricks was based on previous work by the student team's adviser Kathryn Logan, of the MSE department and the Virginia Tech Langley Professor at the National Institute of Aerospace (NIA) in Hampton, Va.

A student team won first place at the Society for Mining, Metallurgy and Exploration (SME) / National Stone, Sand, and Gravel Association (NSSGA) Student Design Competition. The team won a $2,000 cash prize, as well as products donated by InfoMine USA Inc. A second team of students, also from Virginia Tech's Department of Mining and Minerals Engineering (MME), earned fifth place. It marked the second consecutive year that Virginia Tech placed two teams in the finals, as well as the second year in a row that the university captured the top spot at the competition.

A team from the Bradley Electrical and Computer Engineering Department won the Smart Radio Challenge competition for the second time in 2008. The event was part of the annual Software Defined Radio conference held in Washington, D.C. Virginia Tech's Center for Wireless Telecommunications (CWT) team members were awarded first prize for solving the problem of how to handle communications from an infrastructure damaged area. They were grand prize winners in last year's inaugural competition.

A team of six undergraduate aerospace engineering students earned first place honors with their entry of STINGRAE in the 2008 NASA Aircraft Design Competition sponsored by the space agency's Aeronautics Research Mission Directorate's Fundamental Aeronautics Program, part of NASA's Aeronautics Research Mission Directorate. The students' entry into the competition was part of a two-semester senior aircraft design course for graduating seniors.

Major Undergraduate Scholarships

For the 2008-2009 academic year, a total of $2,178,712 was awarded to undergraduate students in the College of Engineering. Funding is provided by 67 scholarships administered by the College and 144 scholarships administered throughout the engineering departments. Four students who entered the College fall semester 2008 were selected as Dean's Scholars. These scholarships are open to all incoming engineering freshmen and are awarded based on academic potential, community service, leadership potential, family circumstances and essay quality. Each scholarship is available for up to four years of undergraduate study, based on academic performance. The College offered three new freshman and 9 continuing Eleanor Davenport Leadership Scholarships. The Davenport Scholarship provides full in-state tuition and fees and is renewable for students who maintain at least a 3.5 grade point average (out of a possible 4.0). The largest sponsor of upper-class scholarships continues to be the Gilbert and Lucille Seay Scholarship Fund, with 128 students receiving a total of $229,100 in scholarship funding.

Additional Facts about the College

The University Honors Program offers a unique challenge to the student with extraordinary intellectual and creative ability. The program is available to all engineering departments and includes the opportunity for enrollment in accelerated courses, enriched sections, and independent study.

A five-year Cooperative Education program for qualified students is available in all of the engineering curricula. After at least two qualifying semesters, students may alternate semesters of study on campus with work periods in industry. Participants are required to have a minimum of a 2.0 overall GPA, and students must have earned a 2.0 in the semester prior to any work experience. Individual departments may impose higher GPA restrictions, including ones based on in-major GPA.

Approximately 7,442 students are enrolled in undergraduate and graduate engineering departments at Virginia Tech as of spring 2009. More than 37 percent of the undergraduate students are from out-of-state, primarily from Maryland, New Jersey, Pennsylvania, and New York. In the entering 2008-2009 freshman class, the average SAT score for the general engineering student was 1270 and the average high school grade point average was 3.87 on a 4.0 scale. Approximately 17 percent of the entering class are female. Another 18.3 percent are members of under-represented populations.

Of the 2007-2008 College of Engineering graduates who were employed full-time, (the most recent year for which statistics are known), 97 percent were employed in a field related to their major. The average annual salary at the bachelor's level was $56,632.

Admission

All students admitted to the College of Engineering as freshmen are placed in the Department of Engineering Education and are designated as General Engineering students. Upon completion of a set of required freshman-level courses, students with acceptable academic records are eligible for transfer into one of the college's 14 degree programs. (The exception is that students who are on the Dean's List their first semester may elect to transfer after one semester.) Admission to a degree program is competitive, with departmental restrictions established

each year by the college. Students transferring to Virginia Tech from another college or university will be considered for admission to a degree granting engineering program if they have completed all courses required of Virginia Tech engineering freshmen, based on transfer credit evaluation by the Office of the Associate Dean for Academic Affairs. Other eligible transfer students may be offered admission into the General Engineering program. All freshmen and transfer admission decisions are made by the University Undergraduate Admissions Office.

The college has a transfer articulation agreement with the Virginia Community College System. VCCS students who complete the Associate Degree in engineering with a minimum 3.0 grade-point-average and who complete a specified list of academic courses are guaranteed admission to the College of Engineering. Not all Virginia Community Colleges offer engineering courses. The Associate Degree in engineering is offered at Central Virginia, J. Sargeant Reynolds, John Tyler, New River, Northern Virginia, Southwest Virginia, Thomas Nelson, Tidewater, and Virginia Western Community Colleges.

The Associate Degree in science with specialization in engineering is offered at Piedmont Virginia Community College.

Engineering Technology credits are not accepted for transfer by the College of Engineering.

Students wishing to transfer into an engineering program from another college or degree program within the university must meet current standards set by the college for each engineering program. Application materials are available in the College of Engineering Academic Affairs office in 212 Hancock Hall.

Required Academic Progress

Minimum requirements for graduation include the attainment of at least a "C" (2.0 Grade Point Average) *average,* both overall and in-major. Some departments may have additional requirements or specifications concerning the acceptability of C**-** or lower grades for in-major courses. Students are expected to sustain progress towards completion of their degree requirements, consulting with their academic advisor regularly.

In addition to meeting university requirements, requirements for enrollment have been established by individual departments..

Entry into a degree-granting department requires that a student successfully complete all first year required courses. Additional requirements are specific to degree programs and are as follows:

- Biological Systems Engineering: a student must have an overall GPA of 2.0 or greater
- Chemical Engineering: a student must have an overall GPA of 2.0 or greater and have completed CHEM 1036/1046.
- Civil Engineering: a student must have a competitive GPA as determined by applications to the department, less than 55 hours earned at Virginia Tech, C- or better grade in ENGE 1024 and ENGE 1104/1114.
- Computer Engineering: a student must earn a grade of C- or greater in the following courses: ENGE 1024 and 1104, MATH 1114, 1224, 1205 and 1206, and PHYS 2305 and have an overall GPA of 2.0 or higher.
- Computer Science: a student must earn a grade of C or greater in CS 1705 or 1124, and have an overall GPA of 2.3 or greater.
- Electrical Engineering: a student must earn a grade of C- or greater in the following courses: ENGE 1024 and 1104, MATH 1114, 1224, 1205 and 1206, and PHYS 2305 and have an overall GPA of 2.0 or higher.
- Engineering Science and Mechanics: a student must have an overall GPA of 2.5 or greater.
- Industrial and Systems Engineering: a student must have an overall GPA of 2.0 or greater.
- Mechanical Engineering: a student must have an overall GPA of 2.5 or greater.

Graduation Requirements

Degree requirements in the college range from 120 to 136 semester hours. Students should see their departmental advisor to determine the exact requirements of their degree. The 2.0 GPA minimum requirement for graduation also applies to all courses attempted in the student's departmental major; substitute non-departmental courses are not included. Where courses have substantial duplication, credit toward graduation will be given for one course only. Up to 2 credits in physical education may be used toward graduation as free elective credit. ESM 4404 and other courses below the academic potential of the engineering student may not be used towards graduation.

The senior academic year must be completed in residence while enrolled in the major department in the College of Engineering.

Engineering curricula have uniform minimum requirements in the humanities and social sciences. The 18-credit minimum includes 6 credits of Freshman English, usually completed during the first year, and 12 credits of humanities and social science electives selected from Areas 2 and 3 (6 credits each) of the Curriculum for Liberal Education.

Although pass/fail courses may be authorized for those who maintain a GPA above 2.0, students should recognize future disadvantages when transferring to other departments or applying for admission to other professional or graduate colleges. Engineering students are expected to take all major department courses on a grade basis. Independent study and undergraduate research courses are available for those who maintain a GPA above 2.0 overall and in their departmental majors; some departments may require a higher GPA.

The College of Engineering will accept advanced ROTC credit as free elective credit towards graduation. Some departments in engineering may allow the use of selected ROTC courses to meet technical elective requirements. Consult specific departments in the College of Engineering for information.

College of Engineering

Aerospace and Ocean Engineering

www.aoe.vt.edu/
E-mail: aoe@vt.edu

University Exemplary Department

C. D. Hall, Head
R. A. Canfield, Assistant Head
Jack E. Cowling Professor: R. L. Simpson
Fred D. Durham Professor: J. A. Schetz
Norris and Laura Mitchell Professor: R. K. Kapania
Professors: R. A. Canfield; A. J. Brown; W. J. Devenport; C.D. Hall; W. H. Mason; R. W. Walters
Associate Professors: W. L. Neu; C. J. Roy; C.A Woolsey
Assistant Professors: M. Farhood; L.S. McCue; M. Patil; M. Philen; G.D. Seidel; C. Sultan
Adjunct Professors: W.L. Hallauer, Jr.
Professors Emeritus: E. Cliff; W. C. Durham; Z. Gurdal; O.F. Hughes; A.K. Jakubowski, E.R. Johnson; C.L. Yates
Faculty Affiliates[1]: R. Batra; M. Cramer; H. Dankowicz; M. Hajj; S. Hendricks; M. Hyer; D. Inman; R.D. Moffitt; S. Ragab; W. Scales; D. Stilwell; D. Telionis
[1] Faculty with regular appointments in other departments

Overview

The aerospace and ocean engineering department offers two bachelor of science degree programs which share a broad range of common interests. Students in the department may major in either aerospace engineering or ocean engineering. Many of the course requirements for these degrees are common because the two curricula share a broad range of common interests. Both programs offer a wide range of technical electives. Students with an interest in both majors may enroll in a double degree program.

The objectives of both of the department's programs include the preparation of students for entry level positions and graduate study in the fields of aerospace engineering and ocean vehicle engineering. The department seeks to provide students with a strong background in fundamentals, including theoretical, experimental, and computational aspects of science and engineering which will facilitate lifelong learning and the ability to pursue advanced study. It also seeks to provide students with a broad education in the aerospace and ocean vehicle fields with coverage of the areas of fluid dynamics, vehicle dynamics and control, propulsion, and structures, including an emphasis on design and synthesis in a team environment.

The department's curricula are both vehicle oriented, with an emphasis on aircraft and spacecraft in the aerospace program and on ships of all types in the ocean engineering program. The department's systems engineering approach to these technologies makes them increasingly applicable to other fields such as the automobile industry, high speed train design, and other transportation related areas. Departmental graduates find positions in these fields as well as with the aerospace industry, NASA, the Department of Defense, the ship building industry, and maritime agencies. Employers range from large, multi-national corporations to small consulting firms.

Classroom studies utilize the students' personal computers and departmental computers. Laboratory classes use the department's outstanding experimental facilities which include a large, research quality subsonic wind tunnel with a twenty four foot long, six-by-six foot cross section test area and state of the art automated control and data collection systems, a 100 foot long towing tank, a Mach 4 supersonic wind tunnel, a Mach 7 hypersonic wind tunnel, a water tunnel, a full scale U. S. Navy A-6 flight simulator and several other facilities.

The department encourages student participation in the Cooperative Education Program which gives qualified students valuable industrial experience while working toward their engineering degrees. The department's required design courses often include multidisciplinary and even international team projects which include travel to universities in other parts of the world.

The Aerospace Engineering and Ocean Engineering programs are accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012, Telephone (410) 347-7700.

The department also offers programs of study leading to the M. Engr., M.S., and Ph.D.

AOE students must meet all Curriculum for Liberal Education requirements and only certain "free" electives and courses designated as "P/F Only" may be taken on a Pass/Fail basis. Lists of approved electives including technical, math, Liberal Education, and other electives are available in the department office and on the department's web page.

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Aerospace Engineering Program

A total of 136 credit hours is required for graduation.

First Year		
First Semester		
CHEM 1035	GENERAL CHEMISTRY	3
CHEM 1045	GENERAL CHEMISTRY LAB	1
ENGE 1024	ENGR EXPLORATION	2
ENGL 1105	FRESHMAN ENGLISH	3
MATH 1114	ELEMENTARY LINEAR ALGEBRA	2
MATH 1205	CALCULUS	3
ELECTIVE*		3
	Credits	17
Second Semester		
ENGE 1114	EXPLORATION OF ENGINEERING DESIGN	2
ENGL 1106	FRESHMAN ENGLISH	3
MATH 1206	CALCULUS	3
MATH 1224	VECTOR GEOMETRY	2
PHYS 2305	FOUNDATIONS OF PHYSICS I	4
ELECTIVE*		3
	Credits	17
Second Year		
First Semester		
AOE 2074	COMPUTATIONAL METHODS	3
AOE 2104	INTRO TO AEROSPACE ENGINEERING	3
ESM 2104	STATICS	3
MATH 2224	MULTIVARIABLE CALCULUS	3
PHYS 2306	FOUNDATIONS OF PHYSICS I	4
ELECTIVE*		1
	Credits	17
Second Semester		
AOE 3094	MATERIALS FOR AEROSPACE AND OCEAN ENGINEERING	3
AOE 3104	AIRCRAFT PERFORMANCE	3
ESM 2204	MECHANICS OF DEFORMABLE BODIES	3
ESM 2304	DYNAMICS	3
MATH 2214	INTRO TO DIFFERENTIAL EQUATIONS	3
ELECTIVE*		3
	Credits	18
Third Year		
First Semester		
AOE 3014	AERO/HYDRODYNAMICS	3
AOE 3024	THIN-WALLED STRUCTURES	3

AOE 3034	VEHICLE VIBRATION AND CONTROL	3
MATH 4564	OPERATIONAL METHODS	3
ME 3134	FUNDAMENTALS OF THERMODYNAMICS	3
ELECTIVE* OR AOE 4134	ASTROMECHANICS	3
	Credits	18
Second Semester		
AOE 3054	AOE EXPERIMENTAL METHODS	3
AOE 3114	COMPRESSIBLE AERODYNAMICS	3
AOE 3124	AEROSPACE STRUCTURES	3
AOE 3134 OR AOE 4140	STABILITY AND CONTROL SPACECRAFT DYNAMICS AND CONTROL	3
MATH ELECTIVE+		3
ELECTIVE*		3
	Credits	18
Fourth Year		
First Semester		
AOE 3044	BOUNDARY LAYER THEORY	3
AOE 4065	DESIGN*	3
AOE 4134 OR ELECTIVE (OPPOSITE OF JUNIOR YR. CHOICE) *	ASTROMECHANICS	3
AOE 4154	AEROSPACE ENGINEERING LABORATORY	1
AOE 4234	AEROSPACE PROPULSION	3
TECHNICAL ELECTIVE+		3
	Credits	16
Second Semester		
AOE 4066	DESIGN**	3
ELECTIVES*		6
TECHNICAL ELECTIVES++		6
	Credits	15

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Ocean Engineering Program

A total of 136 credit hours is required for graduation.

First Year		
First Semester		
CHEM 1035	GENERAL CHEMISTRY	3
CHEM 1045	GENERAL CHEMISTRY LAB	1
ENGE 1024	ENGR EXPLORATION	2
ENGL 1105	FRESHMAN ENGLISH	3
MATH 1114	ELEMENTARY LINEAR ALGEBRA	2
MATH 1205	CALCULUS	3
ELECTIVE*		3
	Credits	17
Second Semester		
ENGE 1114	EXPLORATION OF ENGINEERING DESIGN	2
ENGL 1106	FRESHMAN ENGLISH	3
MATH 1206	CALCULUS	3
MATH 1224	VECTOR GEOMETRY	2
PHYS 2305	FOUNDATIONS OF PHYSICS I	4
ELECTIVE*		3
	Credits	17

Second Year		
First Semester		
AOE 2074	COMPUTATIONAL METHODS	3
AOE 2204	INTRO TO OCEAN ENGINEERING	3
ESM 2104	STATICS	3
MATH 2224	MULTIVARIABLE CALCULUS	3
PHYS 2306	FOUNDATIONS OF PHYSICS I	4
ELECTIVE*		1
	Credits	17
Second Semester		
AOE 3094	MATERIALS FOR AEROSPACE AND OCEAN ENGINEERING	3
AOE 3204	NAVAL ARCHITECTURE	3
ESM 2204	MECHANICS OF DEFORMABLE BODIES	3
ESM 2304	DYNAMICS	3
MATH 2214	INTRO TO DIFFERENTIAL EQUATIONS	3
ELECTIVE*		3
	Credits	18
Third Year		
First Semester		
AOE 3014	AERO/HYDRODYNAMICS	3
AOE 3024	THIN-WALLED STRUCTURES	3
AOE 3034	VEHICLE VIBRATION AND CONTROL	3
MATH 4564	OPERATIONAL METHODS	3
ME 3134	FUNDAMENTALS OF THERMODYNAMICS	3
ELECTIVE*		3
	Credits	18
Second Semester		
AOE 3054	AOE EXPERIMENTAL METHODS	3
AOE 3224	OCEAN STRUCTURES	3
AOE 3264	RESISTANCE AND PROPULSION OF SHIPS	3
AOE 4214	OCEAN WAVE MECHANICS	3
AOE 4244	MARINE ENGINEERING	3
STAT 4705	PROBABILITY AND STATISTICS FOR ENGINEERS	3
	Credits	18
Fourth Year		
First Semester		
AOE 3044	BOUNDARY LAYER THEORY	3
AOE 4254	OCEAN ENGINEERING LABORATORY	1
AOE 4065	SHIP DESIGN	3
AOE 4334	SHIP DYNAMICS	3
TECHNICAL ELECTIVES++		6
	Credits	16
Second Semester		
AOE 4066	SHIP DESIGN	3
ELECTIVES*		9
TECHNICAL ELECTIVES++		3
	Credits	15

Satisfactory Progress: In addition to the requirements of University Policy 91, after attempting 72 credit hours, students must have passed AOE 2074 and AOE 3104, and after attempting 108 credit hours, students must have passed 24 credit hours of in-major courses and have 2.0 overall and in-major GPAs.

* Electives include 6 credits each from Curriculum for Liberal Education (CLE) Areas 2 and 3, 1 credit from CLE Area 6, and 3 credits from CLE Area 7 (the area 7 course may double count with area 2 or 3). The AOE Department requires that ECON 2005 (Principles of Economics) be one of the courses taken in Area 3. The elective credits must include a 1-3 credit computer programming course in C++ or FORTRAN selected from the following: CS 1044 (Introduction to Programming in C), ENGE 2314 (Engineering Problem Solving With C++), ENGE 2324 (Engineering Problem Solving Using Fortran). Other C++ or FORTRAN courses may be approved by

your advisor. Three to eight credits will be free electives.

** AE majors may take either aircraft or spacecraft design. OE majors must take ship design.

+ Choice of MATH 4574 (Vector and Complex Analysis for Engineers) or MATH/AOE 4404 (Applied Numerical Methods) or STAT 4705 (Probability and Statistics for Engineers)

++ The AOE Department requires 9 credits of technical electives of which 6 credits must be an AOE course and the remaining 3 may be selected from a list of 3000 level and higher AOE and other approved technical courses

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Undergraduate Course Descriptions (AOE)

2074 (ESM 2074): COMPUTATIONAL METHODS
Solving engineering problems using numerical methods and software, truncation and round-off error, root finding, linear and polynomial regression, interpolation, splines, numerical integration, numerical differentiation, solution of linear simultaneous equations, numerical solutions of ordinary differential equations. A grade of C- or better required in ENGE prerequisite 1114. Pre: ENGE 1114. Co: MATH 2224.(3H,3C)

2104: INTRODUCTION TO AEROSPACE ENGINEERING
An overview of aerospace engineering from a design perspective; introductory aerodynamics, lift, drag, and the standard atmosphere; aircraft performance, stability, and control; propulsion; structures; rocket and spacecraft trajectories and orbits. Must have a C- or better in pre-requisites ENGE 1114 and PHYS 2305. Pre: ENGE 1114, PHYS 2305. (3H,3C)

2204: INTRODUCTION TO OCEAN ENGINEERING
An overview of ocean engineering from a design perspective. Ship types and geometry; stages of ship design; introductory hydrostatics and stability; hydrodynamics; resistance and propulsion; oceanography and waves; loads on ships; ship structural analysis. Must have a C- or better in pre-requisites ENGE 1114 and PHYS 2305. Pre: ENGE 1114, PHYS 2305. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3014: AERO/HYDRODYNAMICS
Two-dimensional potential flow, stream function, velocity potential, flow superposition, circulation and lift, airfoil characteristics. Two-dimensional airfoil theory and panel methods. Three-dimensional lifting line theory and vortex lattice solutions for finite wings. A grade of C- or better required in each prerequisite. Pre: (3104 or 3204), ESM 2304. (3H,3C)

3024: THIN-WALLED STRUCTURES
Review of mechanics of materials. Stresses in stiffened shell beams. Deformation analysis by energy methods. Multicell beams. Introduction to the matrix stiffness method including truss and beam elements. Must have a C- or better in pre-requisites ESM 2104 and ESM 2204. Pre: ESM 2104, ESM 2204. (3H,3C)

3034: VEHICLE VIBRATION AND CONTROL
Free and forced motions of first order system. Free and forced motions of second order systems both undamped and damped. Frequency and time response. Introduction to control, transfer functions, block diagrams, and closed loop system characteristics. Higher order systems. Must have a C- or better in pre-requisites ESM 2304 and Math 2214. Pre: ESM 2304, (MATH 2214 or MATH 2214H). (3H,3C)

3044: BOUNDARY LAYER AND HEAT TRANSFER
Concepts of viscous flows and physical properties equations of laminar motion with heat and mass transfer; exact and approximate solutions; finite-difference methods; transition to turbulence; analysis in turbulent flows. Conduction and convective heat transfer. Must have a C- or better in pre-requisites AOE 3014, ME 3134, and Math 4564. Pre: 3014, ME 3134, MATH 4564. (3H,3C)

3054: AOE EXPERIMENTAL METHODS
Principles of measurement and measurement systems; standards, accuracy, uncertainty and statistical concepts. Practical electronics, detectors, transducers and instruments for aerospace and ocean engineering. Signal conditioning systems and readout devices; digital data acquisition, structures, structural dynamics, fluid dynamics, materials and wind-tunnel testing. Must have a C- or better in pre-requisites AOE 3014, 3024 and 3034. Pre: 3014, 3024, 3034. (1H,6L,3C)

3094 (MSE 3094): MATERIALS & MANUFACTURING FOR AERO & OCEAN ENGINEERS
This course introduces the student of Aerospace and/or Ocean Engineering to the fundamental properties of materials typically required for structural design. The performance characteristics of metals, ceramics, polymers, and composites are presented and contrasted. Foundation principles underlying materials manufacturing are also presented with the goal of providing an understanding of how processing affects material properties and performance. Must have a C- or better in pre-requisite CHEM 1035. Pre: CHEM 1035. Co: ESM 2204, PHYS 2305.

(3H,3C)

3104: AIRCRAFT PERFORMANCE
Performance of aircraft. Analysis of fluid statics and dynamics affecting aircraft performance. Hydrostatics of the standard atmosphere and development of basic equations of fluid dynamics. Lift and drag. Aircraft static performance. Rates of climb, endurance, range, take off and landing, and turn performance. Must have a C- or better in pre-requisites ESM 2104 and co requisite ESM 2304. Pre: ESM 2104. Co: ESM 2304. (3H,3C)

3114: COMPRESSIBLE AERODYNAMICS
Inviscid, compressible gas dynamics. Continuity, momentum and energy equations, shock waves, Prandtl-Meyer expansions. One-dimensional steady and unsteady flow, Rayleigh line, Fanno line, Shock Tubes. Method of Characteristics, supersonic thin airfoil theory and conical flow. Pre: 3014, ME 3134. (3H,3C)

3124: AEROSPACE STRUCTURES
Aspects of structural analysis pertinent to the design of flight vehicles: aeroelastic divergence, environmental loads, aerospace materials, buckling of thinwalled compression members, and introduction to matrix structural dynamics. Must have a C- or better in pre-requisite AOE 3024. Pre: 3024. (3H,3C)

3134: STABILITY AND CONTROL
Equations of vehicle motion. Linearized analysis. Estimation of stability derivatives, longitudinal and lateral-directional static stability, and control requirements. Dynamic characteristics including stability and mode shapes. Must have a C- or better in pre-requisite AOE 3034. Pre: 3034. (3H,3C)

3204: NAVAL ARCHITECTURE
Buoyancy of ocean vehicles. Hull geometry, line drawings, coefficients of form. Hydrostatic calculations, development of a computer program for hydrostatic analysis. Review and calculations. Intact and damaged stability of ocean vehicles. Large angle stability. Stability criteria. Viscocity. Stress in a fluid. Basic laws of fluid dynamics. Must have a C- or better in pre-requisites ESM 2104 and MATH 2224. Pre: ESM 2104, MATH 2224. Co: ESM 2304. (3H,3C)

3224: OCEAN STRUCTURES
Overview of surface ship, submarine and offshore structural systems, materials and loadings. Application of beam and plate bending and buckling theories. Frame and finite element structural analysis. Must have a C- or better in pre-requisite ESM 3024. Pre: 3024. (3H,3C)

3264: RESISTANCE AND PROPULSION OF SHIPS
Methods of estimating ship resistance; propulsion devices and their efficiencies; Resistance components; Froude scaling of model test data; Methodical series; Planing hulls; Propellers; Waterjets; Propeller design; Computer methods; Advanced marine vehicles. Must have a C- or better in pre-requisites AOE 3204 and AOE 3014. Pre: 3204, 3014. (3H,3C)

4004: COMPUTER-AIDED CONTROL SYSTEM DESIGN
Computer-aided design and analysis of control systems for high-order linear systems. Stability and performance design criteria. Root locus, PID, lead/lag, and pole-placement design methods. Introduction to modern state-space modeling methods. Design problems involving aircraft, ship, space, and ground-vehicle systems. Pre: 3034. (3H,3C)

4024 (ESM 4734): AN INTRODUCTION TO THE FINITE ELEMENT METHOD
The finite element method is introduced as a numerical method of solving the ordinary and partial differential equations arising in fluid flow, heat transfer, and solid and structural mechanics. The classes of problems considered include those described by the second-order and fourth-order ordinary differential equations and second-order partial differential equations. Both theory and applications of the method to problems in various fields of engineering and applied sciences will be studied. Pre: 2074, MATH 2224. (3H,3C)

4034: COMPUTATIONAL STRUCTURAL ANALYSIS
Static and vibratory response of framed structures. The matrix eigenvalue problem for buckling and free vibrations. Static response of laminated composite plates by the finite element method. Pre: 3124 or 3224. (3H,3C)

4054 (CEE 4444) (ESM 4444): STABILITY OF STRUCTURES
Introduction to the methods of static structural stability analysis and their applications. Buckling of columns and frames. Energy method and approximate solutions. Elastic and inelastic behavior. Torsional and lateral buckling. Use of stability as a structural design criterion. Pre: 3024 or CEE 3404. (3H,3C) II.

4064 (CEE 4364): FLUID FLOWS IN NATURE
Course designed to build upon and broaden a basic traditional engineering knowledge of fluid flows into areas concerning a variety of natural occurrences and phenomena that involve fluid motions in important ways. Drag of sessil systems and motile animals, gliding and soaring, flying and swimming, internal flows in organisms, low Reynolds number flows, fluid-fluid interfaces, unsteady flows in nature and wind engineering. I Pre: 3014 or CEE 3304 or ESM 3024 or ME 3404. (3H,3C)

4065-4066: DESIGN
Analysis and design of various space, aeronautical and marine vehicles and systems. Senior standing required. (2H,3L,3C)

4084 (ESM 4084): ENGINEERING DESIGN OPTIMIZATION
Use of mathematical programming methods for engineering design optimization including linear programming, penalty function methods, and gradient projection methods. Applications to minimum weight design, open-loop optimum control, machine design, and appropriate design problems from other engineering disciplines. Pre: MATH 2224. (3H,3C)

4114: APPLIED COMPUTATIONAL AERODYNAMICS
Development of computational methods for application to wing aerodynamic problems. Incompressible airfoil codes. Panel methods and vortex

lattice methods. Finite difference techniques. Transonic and supersonic applications. Pre: 3044, 3114. (3H,3C)

4124: CONFIGURATION AERODYNAMICS
Aerodynamic design of flight vehicles, with emphasis on nonlinear flowfields and configuration concepts. Aerodynamic analysis and design for transonic, supersonic, hypersonic flows, and low speed high alpha flight. Includes case studies of classic configurations and aerodynamic design papers. Pre: 3014, 3114. (3H,3C)

4134: ASTROMECHANICS
Application of Newton's Laws to the dynamics of spaceflight. Two-body problem, Kepler's Laws, energy and time relations, orbit specification and determination. Orbital maneuver and transfer, patched conic approximations, relative motion, and elements of optimal maneuvering. Must have a C- or better in prerequisite ESM 2304. Pre: ESM 2304. (3H,3C)

4140: SPACECRAFT DYNAMICS AND CONTROL
Space missions and the way pointing requirements affect attitude control systems. Rotational kinematics and attitude determination algorithms. Modeling and analysis of the attitude dynamics of space vehicles. Rigid body dynamics, effects of energy dissipation. Gravity gradient, spin, and dual spin stabilization. Rotational maneuvers. Environmental torques. Impacts of attitude stabilization techniques on mission performance. Must have a C- or better in pre-requisites AOE 3034 and 4134. Pre: 3034, 4134. (3H,3C)

4144: AIRCRAFT AUTOMATIC FLIGHT CONTROL
Introduction and history of aircraft automatic flight control. Mathematical models of linear systems elements. Bode amplitude and phase plots of longitudinal and lateral control system analysis. Inputs and system performance assessment. Multiloop flight control systems. Applications to representative aircraft. Pre: 3134, MATH 4564. (3H,3C)

4154: AEROSPACE ENGINEERING LABORATORY
Wind tunnel laboratory experiments related to subsonic and supersonic aerodynamics. Continuation of AOE 3054 for Aerospace Engineering students. Writing of technical laboratory reports; design of experiments. Must have a C- or better in pre-requisites AOE 3054, AOE 3114, AOE 3124 and AOE 3134. Pre: 3054, 3114, 3124, (3134 or 4140). (3L,1C)

4164: SPECIAL TOPICS IN VEHICLE PERFORMANCE
Three dimensional point-mass equations of motion over flat and spherical Earth. Aerodynamic and propulsive modeling. Numerical integration of equations of motion. Analytic approximations and solutions. Energy state models. Advanced topics. Pre: 3104, 3134. (3H,3C)

4174 (ME 4174): SPACECRAFT PROPULSION
Spacecraft propulsion systems and their applications in orbital, interplanetary, and interstellar flight. Rocket propulsion fundamentals; advanced mission analysis; physics and engineering of chemical rockets, electrical thrusters, and propellantless systems (tethers and sails); spacecraft integration issues. Pre: 4234 or ME 4234. (3H,3C)

4204: OCEAN ACOUSTICS
Basic problems and techniques of underwater acoustics; sonar equations, sound propagation in the ocean, generation and detection of underwater sound, background and self noise, reverberation, target strength, applications. Pre: MATH 4564. (3H,3C)

4214: OCEAN WAVE MECHANICS
Introduction to theory of wave motion in different water depth regions, including wave generation and propagation. Description of wave statistics and spectral representation for realistic ocean conditions. Wave forces on stationary structures. Nonlinear waves, wave properties, and methods of analysis. Must have a C- or better in pre-requisites AOE 3014 and MATH 4564. Pre: 3014, MATH 4564. (3H,3C)

4224: PROBABILISTIC ANALYSIS OF OCEAN SYSTEMS
Representation of random phenomena for ocean systems (waves, vehicle motions, wave-induced loads). Concepts of correlation (for vector processes), power spectra, probability density, envelope processes. Responses of linear dynamic systems, statistics of responses, exceedance probability, extremes. Extension to nonlinear systems. Pre: 3234, MATH 4564. (3H,3C)

4234 (ME 4234): AEROSPACE PROPULSION SYSTEMS
Design principles and performance analysis of atmospheric and space propulsion engines and systems. Application of thermodynamics, compressible fluid flow and combustion fundamentals to the design of gas turbine and rocket engines and components, including inlets, turbomachines, combustors, and nozzles. Matching of propulsion system to vehicle requirements. Must have a C- or better in pre-requisites AOE 3113 and ME 3134 or ME 3404 and ME 3124. Pre: (3114, ME 3134) or (ME 3404, ME 3124). (3H,3C)

4244 (ME 4244): MARINE ENGINEERING
Analysis of major ship propulsion devices (propellers, water jets). Integration with propulsion plant and machinery. Characteristics of marine steam turbines, nuclear power plants, marine diesels, and marine gas turbines. Shafting system, bearings, and vibration problems. Must have a C- or better in pre-requisites AOE 3204 and ME 3124 or ME 3134. Pre: 3204, (ME 3134 or ME 3124). (3H,3C)

4254: OCEAN ENGINEERING LABORATORY
Continuation of AOE 3054 for Ocean Engineering students using facilities and instrumentation pertinent to ocean engineering. Writing of technical laboratory reports; design of experiments. Must have a C- or better in pre-requisites AOE 3054 and AOE 3264. Pre: 3054, 3264. (1H,2L,1C)

4274: COMPUTER BASED DESIGN OF OCEAN STRUCTURES
Computer-based structural models for combined finite element analysis, limit state analysis and optimization. Torsion of thin-walled structures. Buckling of stiffened panels and cylinders. Eigenvalue methods for buckling and vibration. Incremental plastic collapse; other progressive collapse. Ultimate strength of large structural modules. Pre: 3224. (3H,3C)

4334: SHIP DYNAMICS
Analysis of motions of rigid body vehicles in water, including influence of added mass and buoyancy. Seakeeping motion responses in waves, wave-induced structural loads, random response analysis via spectral analysis, and extreme response analysis. Introduction to hydroelasticity and maneuvering. Must have a C- or better in pre-requisites AOE 3014, AOE 3034, AOE 4214 and MATH 4564. Pre: 3014, 3034, 4214, MATH 4564. (3H,3C)

4344: DYN OF HIGH-SPEED MARINE CRAFT
Introduction to the dynamics of high-speed craft, including surface effect ships, hydrofoil vessels, semi-displacement monohulls and catamarans, and planing vessels. Pre: 3264, 4334. (3H,3C)

4404 (MATH 4404): APPLIED NUMERICAL METHODS
Interpolation and approximation, numerical integration, solution of equations, matrices and eigenvalues, systems of equations, approximate solution of ordinary and partial differential equations. Applications to physical problems. Partially duplicates 4554 and 3414. Mathematics majors or minors cannot take both 4404 and 3414. X-grade allowed. Pre: MATH 4564, (ESM 2074 or AOE 2074). (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Biological Systems Engineering

www.bse.vt.edu/

University Exemplary Department
S. Mostaghimi, Head and H.E. and Elizabeth F. Alpin Professor
M. L. Wolfe, Assistant Head for Teaching
Professors: . S. Cundiff; T. A. Dillaha; R. D. Grisso; S. Mostaghimi; D. H. Vaughan; M. L. Wolfe
Associate Professors: F. A. Agblevor; J. R. Barone; B. L. Benham; C. D. Heatwole; W. C. Hession; K. Mallikarjunan; C. Zhang
Assistant Professors: J. Arogo Ogejo; D. J. Sample; D. Scott; R. S. Senger; Z. Wen; T. G. Wynn; Y. Zhang
Instructor: S. C. Mariger

Overview

The Biological Systems Engineering program integrates biology, chemistry, and physics with engineering to solve engineering problems associated with the environmentally sound production, processing, and utilization of renewable resources. The curriculum differs from other engineering programs in that it focuses on the sustainable production and management of natural resources and biological materials. The curriculum prepares graduates for a variety of engineering careers. Biological systems engineering graduates are typically employed by environmental consulting firms, state and federal agencies, universities, and food processing, pharmaceutical, biotechnology, and energy industries.

The Biological Systems Engineering program is designed to graduate engineers who will be leaders in applying engineering principles to biological systems. The BSE program prepares graduates to research, design, and implement systems that mimic, adapt, or utilize biological processes for conservation and restoration of natural resources and sustainable development and production of value-added products.

The Biological Systems Engineering program at Virginia Tech provides a strong, broad-based engineering education with opportunity for limited specialization utilizing the 18 credits of technical electives available in the curriculum. Using these electives, BSE students may specialize in one of the two formal options offered by the department: Land and Water Resources Engineering or Bioprocess Engineering. In addition, the program may also be used as a pre-med or pre-vet program.

The **Land and Water Resources Engineering Option** is designed for students interested in a career in environmental protection and natural resources management. Biological, chemical, and engineering principles are applied to the wise use, conservation, and management of natural resources, particularly land and water. The option is unique in that it addresses nonpoint sources of pollution (water pollution caused by rainfall and runoff from land surfaces such as parking lots, golf courses, agricultural fields, construction sites) that are now responsible for more than half of the water quality problems in the United States. To pursue the Land and Water Resources Engineering Option, students must have junior standing and have completed BSE 2105, 2106. Students must receive a grade of C- or better in each course comprising the required 21 hours of the Land and Water Resources Engineering Option and an overall average of 2.0 or better in these courses. The required courses for the Land and Water Resources Engineering Option include:

- BSE 3305: Land & Water Resources Engineering
  BSE 3306: Land & Water Resources Engineering
  BSE 3314: CADD for Land and Water Resources
  BSE 4304: NPS Pollution Modeling & Management
  BSE 4344: Geographic Information Systems for Engineers
  CEE 3104: Introduction to Environmental Engineering
  CSES 3114: Soils
  CSES 3124: Soils Lab

Those who complete the requirements of this option will have Land and Water Resources Engineering Option noted on their transcript.

The **Bioprocess Engineering Option** is tailored for students interested in the design and development of equipment and processes for environmentally responsible manufacturing of value-added products such as food, feed, biofuels, pharmaceuticals, nutraceuticals, chemicals, polymers, and other biological products from renewable biological materials. To pursue the Bioprocess Engineering Option, students must

have junior standing and have completed BSE 2105, 2106. The required courses for the Bioprocess Engineering Option include:

- BSE 3524: Unit Operations in Biological Systems Engineering
  BSE 4504: Bioprocess Engineering
  BSE 4514: Industrial Processing of Biological Materials
  BSE 4524: Biological Process Plant Design
  BSE 4544: Protein Separation Engineering
  BSE 4604: Food Process Engineering
  BIOL 2614: General Microbiology Lab

Those who complete the requirements of this option will have Bioprocess Engineering Option noted on their transcript.

Recognizing the importance of "hands-on" experience in engineering education, instructional laboratories are included in over half the courses in Biological Systems Engineering. These laboratory courses are designed to enhance understanding of theoretical concepts through hands-on activities. In addition to providing a strong and broad-based engineering education, the program emphasizes communication, team work skills, and design experience. The department participates in the Cooperative Education Program, which gives qualified students valuable work experience while pursuing an undergraduate degree. Students are also encouraged to participate in undergraduate research and study abroad programs. Many BSE students are employed in departmental research laboratories.

Design and teamwork experiences are integral parts of the program. In the second year, students work in teams to design, build, and test a solution to an assigned design problem. Throughout the junior year, students acquire knowledge and analysis skills required for successful and professional engineering design through course assignments. The senior year design sequence gives students a comprehensive design experience in which they utilize much of the knowledge they have acquired through their other courses. Students work in teams to solve "real-life" engineering problems.

The relatively small class sizes in Biological Systems Engineering promote excellent interaction between faculty and students. Mentoring begins early in the second year when each student is assigned a faculty advisor who follows the student's progress through graduation.

The bachelor of science in biological systems engineering is offered through the College of Engineering and is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: (410) 347-7700. The department offers over 20 endowed scholarships to students enrolled in Biological Systems Engineering; students are also eligible for College of Engineering and other university scholarships.

In addition to the undergraduate degree program, programs of study leading to master of engineering, master of science, and Ph.D. degrees are available in the department. The BSE department also participates in the Five-Year Bachelor/Master's Degree program. Through this program, undergraduate students with a GPA of 3.5 or above can apply for admission to the Graduate School upon completion of 75 hours of undergraduate study. If admitted, students may apply up to 12 hours of graduate coursework to both their graduate and undergraduate degree requirements. This program provides students an opportunity to complete both a bachelors and master's degree in BSE within five years.

Biological Systems Engineering Program (BSE)

(This program applies to students graduating in 2011.)

First Year

First Semester	*Credits*	*Second Semester*	*Credits*
CHEM 1035: General Chemistry	3	CHEM 1036: General Chemistry	3
CHEM 1045: General Chemistry Lab	1	ENGE 1114: Exploration Eng. Design or ENGE 1104: Exploration Digital Future	2
ENGE 1024 Eng. Exploration	2	ENGL 1106: Freshman English	3
ENGL 1105: Freshman English	3	MATH 1206: Calculus II	3
MATH 1205: Calculus I	3	MATH 1224: Vector Geometry	2
MATH 1114: Elementary Linear Algebra	2	PHYS 2305: Foundations of Physics I	4
CLE Courses[1]	3		**17**
	17		

Second Year

First Semester	*Credits*	*Second Semester*	*Credits*
ESM 2104: Statics	3	ESM 2304: Dynamics	3
Math 2224: Multivariable Calculus	3	Math 2214: Differential Equations	3

Phys 2306: Foundations of Physics I	4	ESM 2204: Mechanics of Deformables	3
Biol 1105: Principles of Biology	3	Biol 1106: Principles of Biology	3
BSE 2105: Introduction to BSE	2	BSE 2106: Introduction to BSE	2
CHEM 2514 or 2535 or 2565: Organic Chemistry	3	ISE 2014: Engineering Economy	2
	18		**16**

Third Year

First Semester	***Credits***	***Second Semester***	***Credits***
BSE 3134: Biological Systems Eng. Seminar	1	BSE 3504: Transport Processes in BSE	3
BSE 3154: Thermodynamics of Biological Sys.	3	BSE 3144: Engr Analysis for Biol Systems	2
ESM 3024: Fluid Mechanics	3	ECE 3054: Electrical Theory	3
CHEM 3615 or 4615 Physical Chemistry	3	ENGE 2344: Computer-Aided Drafting	1
CLE Courses[1]	6	BSE 3524: Unit Operations in BSE	3
		BIOL 2604: General Microbiology	3
	16		**15**

Fourth Year

First Semester	***Credits***	***Second Semester***	***Credits***
BSE 4125: Comprehensive Design Project	2	BSE 4126: Comprehensive Design Project	2
BSE 4004: Instrumentation & Exp. Mechanics	3	BSE elective	3
Engineering topics elective	3	Technical elective	3
BSE elective	3	Engineering topics elective	3
STAT 4604: Stat. Meth. for Engrs. ***or*** STAT 4705: Probability & Statistics for Engrs.	3	CLE Courses[1]	7
Technical elective	3		**18**
	17		

[1] These courses must include six credits each from Curriculum for Liberal Education (CLE) Areas 2 and 3; one credit from Area 6; and three credits from Area 7 (the Area 7 course may double count with Area 2 or Area 3, or with a qualifying technical elective).

In addition to university policy, for graduation, a student must complete 134 credits with a minimum overall GPA of 2.0 and a minimum in-major GPA of 2.0. The in-major GPA calculation uses the following courses: BSE 2105, 2106, 3134, 3144, 3154, 3504, 3524, 4004, 4125, 4126, the 6 hours of required BSE electives and additional BSE electives (if taken).

Eligibility for continued enrollment: upon having attempted 72 hours (including transfer, advanced placement, advanced standing, and credit by examination), "satisfactory progress" toward a B.S. degree will include the following minimum criteria: having a GPA of at least 2.0; earning a C- or better in BSE 2106 and passing Phys 2306, Math 2224, 2214.

Undergraduate Course Descriptions (BSE)

Courses for Engineering Students
(See College of Agriculture and Life Sciences for courses for non-engineering students)

2105-2106: INTRODUCTION TO BIOLOGICAL SYSTEMS ENGINEERING
Introduction to the Biological Systems Engineering profession, overall goals and components of the undergraduate degree program, engineering design process, engineering problem-solving tools and techniques, development of oral and written communication skills, and the importance of professionalism and ethics in Biological Systems Engineering. Pre: ENGE 1016 or ENGE 1104 or ENGE 1114 for 2105; 2105 for 2106. Co: BIOL 1105 for 2105; BIOL 1106 for 2106. (1H,3L,2C)

2984: SPECIAL STUDY
Variable credit course.

3134: BIOLOGICAL SYSTEMS ENGINEERING SEMINAR
Critical review of technical and professional articles on current topics in Biological Systems Engineering. Development of oral presentation and technical writing skills. Contemporary ethical, professional, and global issues in Biological Systems Engineering. Pre: 2106. (2L,1C)

3144: ENGINEERING ANALYSIS FOR BIOLOGICAL SYSTEMS USING NUMERICAL METHODS
Solving engineering problems related to biological systems using numerical analysis including root finding, numerical integration, differentiation, interpolation and numerical solution of ordinary differential equations. Error analysis and programming with engineering software. Pre: 2106, MATH 2214. (2H,2C)

3154: THERMODYNAMICS OF BIOLOGICAL SYSTEMS
Fundamental concepts, first and second laws, psychrometrics applied to plant and animal environments, introduction to Gibbs energy, and application of calorimetry to gain basic understanding of energy flow in a biological system. Pre: MATH 2214. (3H,3C)

3305-3306: LAND AND WATER RESOURCES ENGINEERING
3305: Surface and groundwater hydrology, soil physics, irrigation principles, nonpoint source pollution control, land surveying. 3306: Erosion and sediment transport; transport and fate of nutrients, pesticides and pathogens; design of wetlands, detention facilities and other management practices for rural and urban nonpoint source pollution control; design of small dams and reservoirs. Pre: 2106. Co: CSES 3114, ESM 3024 for 3305. (2H,3L,3C)

3314: COMPUTER-AIDED DESIGN AND DRAFTING FOR LAND AND WATER RESOURCES ENGINEERING
Introduction to computer-aided design and drafting for land and water resources engineering. Representation of features in two and three dimensions for documentation and visualization of land and water resources engineering projects. Create plans, cross sections, detail drawings, and three dimensional visualizations using computer- aided design and drafting tools. Partial duplication of ENGE 2344. Pre: 3305. (3H,2L,2C)

3414 (CEE 3414): DESIGN OF WOOD STRUCTURES
Wood as an engineering material, loads, structural lumber, glulam, plywood, design of single structural elements, combined stress design, fastener design, truss design, pole and post-frame structures, shear wall, and diaphragm design. I Pre: CEE 3404. (3H,3C)

3494: ADVANCED WELDING TECHNOLOGY
Techniques in welding that include gas, submerged metal arc, metal inert gas, pulsed arc, and tungsten inert gas welding. Design of welding structures, fundamentals of heat treatment, and plasma arc cutting. Consent required. I Pre: ISE 2214. (3L,1C)

3504: TRANSPORT PROCESSES IN BIOLOGICAL SYSTEMS
Introduction to material and energy balances in biological systems. Fundamentals of heat and mass transfer in biological systems. One and two dimensional conduction, convection, and diffusion of thermal energy and mass. Heat and mass transfer rates, steady and unsteady state conduction, convection, diffusion; design of simple heat exchangers. Application of these topics and fluid mechanics to fluid handling, bacterial growth, plant nutrient uptake, enzymatic reactions. Pre: 3154, ESM 3024. (3H,3C)

3514: PHYSICAL PROPERTIES OF BIOLOGICAL MATERIALS
Physical characteristics and physical properties to include mechanical, thermal, and electromagnetic properties of whole and processed biological products are studied. Laboratory methods for measuring physical properties are included. Pre: ESM 3024. (2H,3L,3C) II.

3524: UNIT OPERATIONS IN BIOLOGICAL SYSTEMS ENGINEERING
Unit operations for processing biological materials including heat exchangers, evaporation, drying, mixing, homogenization, extrusion, phase and multi-phase separation, and size reduction. Laboratory hands-on experience in various unit operations. Co: 3504. (2H,3L,3C)

4125-4126: COMPREHENSIVE DESIGN PROJECT
4125: Identify and develop an engineering design project using the team approach; use of literature resources to define project objectives and approach; present project proposal in a professional written and oral manner; engineering ethics, professionalism and contemporary issues. 4126: Complete a comprehensive design project using the team approach and make professional presentations of the final design. Completion of 96 hours and overall GPA of 2.0 or better. Pre: (3306 or 3414 or 3524). 4125: (1H,3L,2C) 4126: (6L,2C)

4144: BIOLOGICAL SYSTEMS SIMULATION
Study of modeling techniques and application of these techniques to reaction kinetics, crop growth, and systems analysis. Emphasis is on development of basic understanding of methods for defining and evaluating interrelationships between parameters in a biological system. I Pre: 3504. (3H,3C)

4304: NONPOINT SOURCE POLLUTION MODELING AND MANAGEMENT
Concepts, principles and application of modeling and monitoring for assessment and management of nonpoint source pollution. Design and implementation of monitoring systems. Concepts of modeling agroecosystems and land use impacts on hydrologic/water quality response of upland catchments. Model selection, calibration, validation, and application for comparative analysis. Screening models using Geographic Information Systems. Case studies in current watershed management issues, with a focus on agricultural waste and nutrient management, using existing field and watershed models. Pre: 3306. (2H,3L,3C)

4324: NONPOINT SOURCE POLLUTION
Engineering aspects of the sources and magnitudes of nonpoint source pollution, major causative factors, and control techniques. Emphasis on hydrologic factors, erosion, atmospheric deposition, adsorption and degradation of pollutants in soil, disposal of agricultural wastes, and management for the control of urban and agricultural nonpoint source pollution. Pre: CEE 3104. (3H,3C)

4344: GEOGRAPHIC INFORMATION SYSTEMS FOR ENGINEERS
Conceptual, technical, and operational aspects of geographic information systems as a tool for storage, analysis, and presentation of spatial information. Focus on engineering applications in resource management, site selection, and network analysis. Laboratory work and senior standing required. (2H,3L,3C) II.

4394: WATER SUPPLY AND SANITATION IN DEVELOPING COUNTRIES
Social, economic and engineering principles of water supply and sanitation in developing countries as affected by climate, cultural and sociological factors, and material and financial resources. Pre: CEE 3104. (3H,3C) II.

4404: DESIGN OF MACHINERY SYSTEMS
Functional analysis and engineering design and selection of machinery components and systems for agricultural, food, and processing applications. Design, sizing, and selection of components, power units (internal combustion engines and electronic motors), transmission devices (belts, chains, gears, hydraulics, and drivelines), material handling devices, (pumps, fans, and conveyors), and agricultural equipment (tillage, planting and chemical applications). Pre: ESM 2204, ESM 2304, ESM 3024, BSE 3154. (2H,3L,3C)

4424 (ME 4434): FLUID POWER SYSTEMS AND CONTROLS
Design and analysis of industrial and mobile hydraulic systems. Hydrostatic transmissions. Electrohydraulic servovalve characteristics and use in precise position and speed control application. Characteristics of pumps, motors, valves, and activators illustrated in laboratory exercises. Pre: ESM 3024 or ME 3404. (2H,3L,3C)

4504: BIOPROCESS ENGINEERING
Study of the engineering concepts for biological conversion of raw materials to food, pharmaceuticals, fuels, and chemicals. Emphasis is placed on enzyme kinetics and technology, bioreaction kinetics, analysis, and control of bioreactors and fermenters, and downstream processing of bioreaction products. Pre: 3504, BIOL 2604, (CHEM 2514 or CHEM 2535 or CHEM 2565 or CHEM 2565H), (CHEM 3615 or CHEM 3615H or CHEM 4615). (3H,3C) II.

4514: INDUSTRIAL PROCESSING OF BIOLOGICAL MATERIALS
Principles of industrial processing of biological materials. Surveys the major food processing and biopharmaceutical industries and the major processing steps involved in the production of vegetable oils, starch, corn sweeteners, biofuels, protein, dairy products, meat and poultry, seafood, fruits and vegetables, and biopharmaceuticals. Economics, safety, environmental, and quality control factors involved in the processing of biological materials. Pre: (3524, 4604). (3H,3C)

4524: BIOLOGICAL PROCESS PLANT DESIGN
Engineering principles for design of systems for processing biological materials into primary and secondary products. Delivery, scheduling, storage requirements, economic analysis. Process control and instrumentation of bioprocessing plants. Pre: 4504, 4604. (3H,3C)

4544 (CHE 4544): PROTEIN SEPARATION ENGINEERING
Concepts, principles and applications of various unit operations used in protein separations. Properties of biological materials, such as cells and proteins, and their influences on process design. Design of processes for protein purification based on the impurities to be eliminated. Concepts and principles of scale-up of unit operations. Case studies in practical protein recovery and purification issues, with a focus on enhanced protein purification by genetic engineering. Protein purification process simulation and optimization using process simulation software. Pre: 3504 or CHE 3144. (3H,3C)

4604: FOOD PROCESS ENGINEERING
Analysis and design of food processing operations including thermal pasteurization and sterilization, freezing, extrusion, texturization, and mechanical separation. Pre: 3504, 3524. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

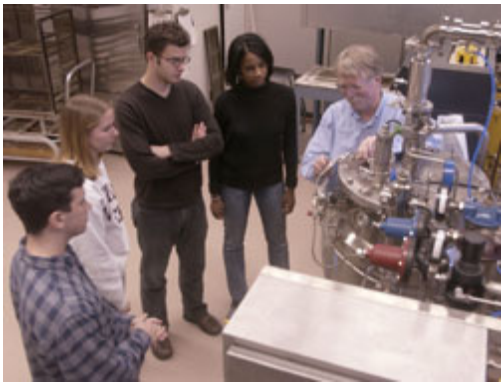
4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Engineering

Chemical Engineering

www.che.vt.edu/



John Y. Walz, Head
Harry C. Wyatt Professor: D.G. Baird
Frank C. Vilbrandt Professor: Y.A. Liu
Fred W. Bull Professor: S.T. Oyama
Professors: L.E.K. Achenie; D.F. Cox; R.M. Davis; W.A. Ducker; E. Marand; E. Kiran; J.Y. Walz
Associate Professors: C.J. Cornelius; A.S. Goldstein
Assistant Professors: S.M. Martin; A.W. Morgan; P. Rajagopalan
Adjunct Professors: P.L. Durrill; E.G. Joseph
Affiliated Research Faculty: K. Forsten Williams
University Distinguished Professor Emeritus: A.M. Squires; G.L. Wilkes
Professor Emeritus: W.L. Conger; P.R. Rony; J.T. Sullivan; G.B. Wills
ChE Co-op Advisor: A.S. Goldstein

Overview

Skillful and creative applications of the principles of chemistry, biochemistry, biology, mathematics, and physics are needed to solve the problems now confronting society. Whether these problems involve energy, food, health, environmental quality, materials, or whatever impacts us, the modern chemical engineer is the professional concerned with finding economically and socially acceptable solutions. The program prepares graduates for employment in a great variety of industries including the chemical, petroleum, biochemicals, pharmaceutical, paper, environmental, fibers, plastics, food, electronics, and consumer product industries. Students may customize their academic program around an industry of their interest by judiciously selecting electives. For example, areas of concentration such as polymers, biotechnology, marketing, and environmental chemical engineering are common choices.

The goal of the undergraduate program is to produce chemical engineering graduates who are prepared for professional careers and/or graduate school. In fulfilling this goal the department has set three primary objectives for the graduates:

- Graduates will demonstrate a thorough understanding of chemical engineering fundamentals;
- Graduates will be successful in a variety of professional careers, including those outside of traditional chemical engineering fields;
- Graduates will be able to function in a modern professional environment

The curriculum has been developed to meet the department goal and the objectives for the graduates. The curriculum is demanding and a GPA of at least 2.50 is recommended for transfer into the program at the sophomore level. An average GPA of at least 2.00 in all ChE courses attempted is required for continued enrollment in the department. The department has specific grade policies for continuation in the program and for graduation. For further information on these policies, please contact the department.

The chemical engineering curriculum integrates studies in thermodynamics, fluid mechanics, heat transfer, mass transfer, process control, reaction kinetics, plant and process design, verbal and written communications, and reaction kinetics, along with professional ethics and environmental awareness. Students gain hands-on experience with the equipment described in the courses during the summer Unit Operations Laboratory. The laboratory and the senior design courses are recognized as two of the high points in the undergraduate program. Throughout these studies, the student learns the elements of the design of chemical processes and chemical processing equipment. The experience culminates in participation in a national senior-level design contest. The computer is a necessary tool in all the courses and the same software used in industry is used in the design courses.

In addition to the basic undergraduate program outlined here, more sophisticated and specialized programs leading to the M.S. and Ph.D. in chemical engineering also are offered (see Graduate Catalog).

The department participates in the Cooperative Education Program whereby qualified students may alternate periods of study with periods of professional employment.

The ChE website may be viewed at: www.che.vt.edu

Chemical Engineering Program

A total of 135 semester credits are required for graduation (effective with Class of 2006).

First Year	
First Semester	
CHEM 1035: General Chemistry	3
CHEM 1045: General Chemistry Lab	1
ENGE 1024: Engineering Explorations	2
ENGL 1105: Freshman English	3
MATH 1205: Calculus	3
MATH 1114 : Linear Algebra	2
Elective	3
Credits	17
Second Semester	
CHEM 1036: General Chemistry	3
CHEM 1046: General Chemistry Lab	1
ENGE 1114: Exploration Engineering Design	2
ENGL 1106: Freshman English	3
MATH 1206: Calculus	3
MATH 1224: Vector Geometry	2
PHYS 2305: Foundations of Physics I	4
Credits	18
Second Year	
First Semester	
CHE 2114: Mass and Energy Balances	3
CHEM 2535: Organic Chemistry (or 2565)	3
CHEM 2545: Organic Chemistry Lab	1
CHEM 3615: Physical Chemistry	3
MATH 2224: Calculus	3
PHYS 2306: Foundations of Physics II	4
Credits	**17**
Second Semester	
CHE 2004: CHE Sophomore Seminar	1
CHE 2124: CHE Simulations	2
CHE 2164: CHE Thermodynamics	3
CHEM 2536: Organic Chemistry (**or** 2566)	3
CHEM 2546: Organic Chemistry Lab	1
CHEM 3625: Physical Chemistry Lab	1
MATH 2214: Intro to Diff. Equations	3
Elective	3
Credits	**17**
Third Year	
First Semester	
CHE 3114: Fluid Transport	3
CHE 3134: Separation Processes	3
ENG 3764: Technical Writing	3

STAT 4604: Statistical Methods for Engineers	3
MATH 4564: Oper. Methods	3
Credits	**15**
Second Semester	
ChE 3015: Process Meas. and Controls	3
CHE 3044: Heat Transfer	2
CHE 3144: Mass Transfer	3
CHE 3184: Chemical Reactor Analysis and Design	3
CHE 4134: Chemical Process Modeling	2
Elective*	3
Credits	**16**
Summer Term (must precede senior year)	
ChE 4014: ChE Laboratory	5
Fourth Year	
First Semester	
CHE 4104: Process Materials	3
ChE 4185: Process and Plant Design (WI)	4
ESM 2214: Statics and Mechanics of Materials	3
Electives*	6
Credits	**16**
Second Semester	
ChE 4186: Process and Plant Design (WII)	4
Electives*	10
Credits	**14**

*** Elective Hours: 25, as specified below**

16 hours **Liberal Education** (choose from approved lists) -- Areas 2, 3, 6, 7
3 hours **Technical Electives** (choose from approved list)
6 hours **Free Electives**

The following are **areas of concentration** where students could use electives. Lists of approved courses for these concentrations are available in the Department of Chemical Engineering.

1. No concentration
2. Marketing and Chemical Distribution
3. Biochemical Engineering
4. Polymers

As part of **progress toward a degree**, a student must have a grade of C- or better in all ChE-prefix courses and maintain a GPA of 2.0 or above in all ChE prefix courses. If in-major GPA drops below 2.0 at any time, the student will be placed on departmental probation. The student cannot remain on departmental probation for more than two consecutive semesters. In the case that a student has not achieved an in-major 2.0 or better after two semesters, the student is prohibited from registering for any ChE courses for at least one semester and, after that, only with permission of ChE department head. All ChE credits are used to calculate in-major GPA.

Students who plan to co-op should talk with with Dr. Goldstein (127 Randolph) in the ChE department.

For additional information about the Chemical Engineering curriculum, please contact the department head.

The Chemical Engineering Department at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 20120-4012 - telephone (410) 347-7700.

Undergraduate Course Descriptions (CHE)

2004: CHEMICAL ENGINEERING SOPHOMORE SEMINAR
Career opportunities and current topics of interest in the Chemical Engineering profession. Pass/Fail only. (1H,1C)

2114: MASS AND ENERGY BALANCES
Stoichiometric and composition relationships, behavior of gases, vapor pressures, solubility, mass balances, recycling operations, energy balances, first law of thermodynamics, thermophysics, thermochemistry, fuels and combustion, application to chemical operations. Pre: (CHEM 1035 or CHEM 1035H or CHEM 1015 or CHEM 1074H or CHEM 1074 or CHEM 1055 or CHEM 1055H), (MATH 1206 or MATH 1206H). (3H,3C)

2124: CHEMICAL ENGINEERING SIMULATIONS
Many chemical engineering processes lead to sets of linear and nonlinear algebraic equations. This course will focus on numerical methods for solving these types of problems. In addition, techniques for analyzing data to evaluate different models and to obtain model parameters will be developed. Students will learn how to evaluate whether the information provided is sufficient to solve steady-state material balances frequently encountered in process design. Students will be exposed to both mathematical software as well as process modeling software useful for solving process engineering problems and when each should be utilized. Pre: 2114, (MATH 2224 or MATH 2224H). (2H,2C)

2164: CHEMICAL ENGINEERING THERMODYNAMICS
First and Second Laws, properties fluids, properties of homogeneous mixtures; phase equilibria, chemical-reaction equilibria. Pre: 2114. Co: CHEM 3615. (3H,3C)

2984: SPECIAL STUDY
Variable credit course.

3015-3016: PROCESS MEASUREMENT & CONTROL
3015: Common process measurements; applications to theory and practice of automatic control of chemical processes; 3016: Design and laboratory practice underlying the automatic computer control of chemical processes. Pre: (MATH 4564 or MATH 4544) for 3015; MATH 4564 or MATH 4544 for 3016. Co: 2124, 3184, 3044 for 3015; 2124 for 3016. 3015: (3H,3C) 3016: (1H,3L,2C)

3044: HEAT TRANSFER
One and two dimensional conduction, convection, and diffusion of thermal energy; heat transfer rates, steady state and unsteady state conduction, convection; design of heat exchangers; forced and free convection boiling and condensation. Pre: 2164, 3114, (MATH 4544 or MATH 4564). (2H,2C)

3114: FLUID TRANSPORT
Fluid statics, surface tension, fluid dynamics, Newton's Law of viscosity, momentum transport, laminar and turbulent flow, velocity profiles, flow in pipes, flow around objects, non-Newtonian fluids, design of piping systems, pumps and mixing. Pre: 2114, PHYS 2305. Co: MATH 4564. (3H,3C)

3134: SEPARATION PROCESSES
Binary separations and multicomponent separations, distillation, batch distillation, extraction, absorption, McCabe-Thiele and Ponchon Savaret methods, short cut methods, design of plate columns, plate and column efficiencies. Pre: 2114, (CHEM 3615 or CHE 2164). (3H,3C)

3144: MASS TRANSFER
Multidimensional molecular diffusion and convection of single and multi-component systems; mass transfer rates; steady state, quasi-steady state and transient mass transfer; effect of reactions on mass transfer; convective mass transfer coefficients; design of stage and continuous gas/liquid contractors, membrane, liquid-liquid and liquid-solid separation processes, artificial kidney and drug delivery systems. Pre: 3114, 2164, (MATH 4544 or MATH 4564). (3H,3C)

3184: CHEMICAL REACTOR ANALYSIS AND DESIGN
Power-law rate expressions, kinetic data, rate constants, Arrhenius equation, design of reactors, reactor behavior. Pre: 2164, (MATH 2214 or MATH 2214H or MATH 4544). Co: 3144, 3044. (3H,3C)

4014: CHEMICAL ENGINEERING LABORATORY
Practical experience in the planning of experimentation, gathering of experimental data, interpretation of data, and the preparation of written and oral reports. Use of small scale processing equipment. Applications include momentum transfer, heat transfer, mass transfer, and chemical reaction. Use of automatic control and data acquisition. Grade of C- or better in all CHE prefix courses and in-major GPA of 2.0 or better are required. Pre: 3015, 3044, 3134, 3144, 3184, ENGL 3764. (15L,5C)

4034: CHEMICAL REACTION DESIGN
Reactor design for multiple reactions, nonisothermal operation, optimum reactor operation and configurations, design and analysis of heterogeneous reactors, mass transfer limitations. Pre: 3184. (3H,3C)

4044: APPLIED MATHEMATICS IN CHEMICAL ENGINEERING
Mathematical techniques applied to the solution of chemical engineering problems. Pre: 3134, 3184. (2H,2C)

4104: PROCESS MATERIALS
Basics of materials science as it relates to the interest of the chemical engineer. The course emphasizes the three fundamental areas of material science being polymer materials, metallics, and ceramic/inorganic glasses. The general molecular structure property – application behavior of each area will be presented but with a focus when possible on topics related to the field of chemical engineering. Pre: 2164, (CHEM 2535 or CHEM 2565). (3H,3C)

4134: CHEMICAL PROCESS MODELING
Mathematical modeling of chemical processes, application of numerical techniques to the solution of equations, use of a programming language to write programs for calling numerical subroutines, numerical solutions of problems resulting in partial differential equations. Pre: 2124, 3114. Co: 3044, 3184, 3144. (2H,2C)

4144 (MKTG 4144): BUSINESS AND MARKETING STRATEGIES FOR THE PROCESS INDUSTRIES
Business strategies and industrial marketing concepts, and their application in the chemical, pharmaceutical and related process industries. The

course is designed for engineers and other students planning a career in the process industries. Junior standing required. (3H,3C)

4185-4186: PROCESS AND PLANT DESIGN
Chemical process synthesis and plant design, economic analysis of alternative processes, process equipment design and specifications, computer-aided process design and simulation, design case studies, application of scientific and engineering knowledge to practical design problems. Grade of C- or better in all CHE prefix courses and in-major GPA of 2.0 or better is required. Pre: 3144, 3134, 3184, 3044 for 4185; 4185 for 4186. (4H,4C)

4214: INTRODUCTION TO POLYMER MATERIALS
Basics of polymeric materials including description and categorization of macromolecules; characterization; mechanical properties; rubbery, glassy, crystalline, and viscous flow behavior. Pre: CHEM 2536, CHE 2164. (3H,3C)

4224: INTRODUCTION TO POLYMER PROCESSING
Basic principles of momentum and heat transfer applied to the analysis of polymer processing operations. Introduction to polymer rheology. Pre: 3144, 3044. (3H,3C)

4334: INTRO COLLOID INTERFACE SCI
Properties and behavior of colloidal systems, primarily in liquid environments. Size characterization and description, Brownian motion, interparticle forces, dispersion stability, and experimental techniques for characterizing these systems. Pre: 2164, 3144. (3H,3C)

4544 (BSE 4544): PROTEIN SEPARATION ENGINEERING
Concepts, principles and applications of various unit operations used in protein separations. Properties of biological materials, such as cells and proteins, and their influences on process design. Design of processes for protein purification based on the impurities to be eliminated. Concepts and principles of scale-up of unit operations. Case studies in practical protein recovery and purification issues, with a focus on enhanced protein purification by genetic engineering. Protein purification process simulation and optimization using process simulation software. Pre: BSE 3504 or CHE 3144. (3H,3C)

4904: PROJECT AND REPORT
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

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College of Engineering

Civil and Environmental Engineering

www.cee.vt.edu/

University Exemplary Department

W.S. Easterling, Head
David P. Burrows Professor: M.C. Vorster
W. Curtis English Professor: W.R. Knocke
Montague-Betts Professor of Structural Steel Design: W.S. Easterling
Nick Prillaman Professor: J.T. Novak
Newport News Shipbuilding Professor: T.A. Dingus
Charles E. Via, Jr. Professor: G.M. Filz
Charles E. Via, Jr. Professor: R.E. Weyers
Charles E. Via, Jr. Professor: S. Kikuchi
Charles Lunsford Professor: M.A. Edwards
Vecellio Professor: J.M. de la Garza
Professors: G.D. Boardman; T.E. Cousins; W.E. Cox; A.M. Dietrich; P. Diplas; T.J. Grizzard; A.G. Hobeika; J.C. Little; J.R. Martin II; G. E. Moglen; H.A. Rakha; E. Sotelino; A.A. Trani; M.A. Widdowson
Associate Professors: T.L. Brandon; F.A. Charney; R.L. Dymond; G.W. Flintsch; D.L. Gallagher; M.J. Garvin; R.A.Green; K.L. Hancock; L.C. Marr; M. Mauldon; A. Pruden; C.L. Roberts-Wollmann; K.B. Rojiani; S.K. Sinha; P.J. Vikesland; L. Wang; W. J. Wright
Assistant Professors: M.M. Abbas; E.T. Hester; C.D. Moen; P.M. Murray-Tuite; D. E. Young
Research Associate Professor: A. Godrej
Research Assistant Professor: J. Dove; C.G. Olgun
Professors Emeritus: R.M. Barker; D.R. Drew; J. M. Duncan; D. A. Garst; R.C. Hoehn; S.M. Holzer; J.M. Hughes; D.F. Kibler; T. Kuppusamy; J.K. Mitchell; T.M. Murray; H. J. Pence; R. H. Plaut; C.W. Randall; D. Teodorovic; R.D. Walker

The Civil and Environmental Engineering Department offers one undergraduate degree: the B.S. in Civil Engineering. This program is described in the following sections:

Overview

The Charles Edward Via, Jr. Department of Civil and Environmental Engineering offers an undergraduate program that facilitates development of critical analytical abilities and the necessary core of knowledge and skills for entry into the civil engineering profession or graduate studies. This body of knowledge includes the scientific procedures for formulating and testing theories and the procedures for applying theory to enhance welfare through engineering analysis, synthesis, and design. The civil engineer plays a key role in the design, construction, maintenance, and management of society's physical infrastructure, including transportation and communication systems, structural facilities for housing human activities, water resource management systems, natural resource development systems, and facilities and programs for environmental protection. The Civil Engineering Program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

Emphasis in civil engineering education is on fundamental principles of science and mathematics and their application to solving human problems. But civil engineering activities interact in many ways with the natural and social environments within which they take place. Accordingly, the civil engineering program strives to create an awareness of the ecological, social, economic, and political context of engineering and attempts to prepare the civil engineer for the necessary interactions with other professions and the public. An effort to instill an understanding of the role of the civil engineer in satisfying total societal needs is an integral part of the civil engineering program.

Consistent with the general program goal of facilitating development of student competence necessary for entry into engineering practice or graduate school, the Department has developed the following program objectives:

Within a few years of program completion, graduates of the Civil and Environmental Engineering Department should be able to combine skills gained through academic preparation and post-graduation experience so that they can:

1. Exhibit technical competence through application of engineering knowledge, problem-solving skills, and modern tools from multiple areas of civil engineering practice in the analysis, evaluation, design, and construction of civil engineering systems and system components.
2. Apply skills of effective communication, teamwork, leadership, and professional and ethical behavior as complements to technical competence.

3. Incorporate economic, environmental, social, and sustainability considerations into the practice of civil engineering.
4. Continue their technical and professional development, which may include professional licensure, graduate level education, continuing education courses, self-directed study, and participation in conference and committee activities.

The civil engineering curriculum provides a choice of four curricular tracks: General Civil Engineering; Environmental and Water Resources; Infrastructure Systems; and Structures, Geotechnical, and Construction. These tracks contain a common freshman and sophomore year, with selection of a track made during pre-registration of the second semester of the sophomore year. Other than the general civil engineering track, which maintains a broad perspective, these tracks provide greater focus on the individual areas of civil engineering practice; however, they have common elements to ensure that all students receive a basic civil engineering education.

All the curricular tracks place significant emphasis on engineering design. The initial exposure to design occurs early in the curriculum, with the major emphasis provided in the junior and senior years of the individual tracks. Each student must select a "design project" course that provides an integrated approach to design that draws on knowledge from a minimum of three disciplinary areas. Each of these courses involves preparation of written reports and oral presentations, and each provides teamwork experience through utilization of a group approach to project design.

Classroom instruction in the civil engineering program is reinforced by instructional laboratories in the major areas of civil engineering practice. The department seeks to employ the latest educational technology and innovative teaching methods.

The department participates in the Cooperative Education Program in which qualified students may alternate semesters of study with semesters of professional employment. The department encourages all students to participate in professional work experience prior to graduation.

Contact person for undergraduate Civil and Environmental Engineering programs is Kara Lattimer, CEE Academic and Career Advisor at 540/231-7148 or e-mail: karalatt@vt.edu.

Full programs of graduate study are available, leading to the M.Eng., M.S., and Ph.D. in civil engineering. Graduate degree programs concentrate in one of five major areas: construction engineering and management, environmental and water resources engineering, geotechnical engineering, structural engineering and materials, and transportation and infrastructure systems engineering. For details, see the Graduate Catalog.

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Civil Engineering Program *(for 2011)*

Note: Graduation requires a total of 131 semester credits. Requirements are subject to change; prospective students should contact the Department prior to initiating individual programs of study.

Beginning with students graduating in 2012, entry to the CEE Department will be on a competitive basis to control departmental enrollments. Please check the CEE website or contact the Department for specific entry requirements for students graduating in 2012 and beyond.

First Year	
First Semester	
Chem 1035: General Chemistry	3
Chem 1045: General Chemistry Lab	1
Math 1205: Calculus I	3
Math 1114: Linear Algebra	2
Engl 1105: Freshman English	3
ENGE 1024: Engr. Exploration	2
Liberal Education Elective: See remarks	1
Credits	15
Second Semester	
Phys 2305: Foundations of Physics I	4
Math 1206: Calculus II	3
Math 1224: Vector Geometry	2
Engl 1106: Freshman English	3
ENGE 1114 Exploration of Engineering or ENGE 1104 Exploration of Digital Future	2

Liberal Education Elective: See remarks	3
Credits	17
Second Year	
First Semester	
PHYS 2306: Foundations of Physics I	4
MATH 2224: Multivariable Calculus	3
ESM 2104: Statics	3
GEOS 2104: Elements of Geology	3
CEE 2804: Intro. to CEE	2
ENGE 2824: CEE Drawings & CAD	1
Credits	**16**
Second Semester	
STAT 3704: Statistics for Engr. Applications	2
MATH 2214: Differential Equations	3
ESM 2204: Mech. of Deformable Bodies	3
ISE 2014: Engineering Economy	2
CEE 2814: CEE Measurements	4
Liberal Education Elective: See remarks	3
Credits	**17**

Beginning with junior year – Students select one of four tracks below:

General Civil Engineering Track

Third Year	
First Semester	
ENGL 3764: Technical Writing	3
CEE 3684: CEE Materials	3
CEE 3304: Fluid Mechanics for CEE	3
CEE 3404: Theory of Structures	3
CEE 3104: Intro. to Environmental Engr.	3
Basic/Engr.Science Elective: See Remarks	3
Credits	**18**
Second Semester	
CEE 3514: Intro to Geotechnical Engr.	3
CEE 3014: Construction Management	3
CEE 3314: Water Resources Engr.	3
CEE 3604: Intro. to Transportation Engr.	3
CEE 3804: Computer Applications in CEE	3
Credits	**15**
Fourth Year	
First Semester	
CEE 4804: Prof. & Legal Issues in Engr.	3
CEE Technical Electives: See Remarks	6
Basic/Engr.Science Elective: See Remarks	3
Liberal Education electives: See remarks	6
Credits	**18**
Second Semester	
CEE Technical Electives: See Remarks	12

Free Elective: See Remarks	3
Credits	**15**

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Environmental and Water Resources Track

Third Year	
First Semester	
ENGL 3764: Technical Writing	3
CEE 3514: Intro to Geotechnical Eng.	3
CEE 3304: Fluid Mechanics for CEE	3
CEE 3104: Intro. to Environmental Engr.	3
CEE 3804: Computer Applications in CEE	3
Credits	**15**
Second Semester	
CEE 3684: CEE Materials	3
CEE 3014: Construction Management	3
CEE 3314: Water Resources Engr.	3
CEE 4104: Water & Wastewater Design	3
Basic/Engr. Science Elective: See Remarks	3
Liberal Education Elective: See Remarks	3
Credits	**18**
Fourth Year	
First Semester	
CEE 4804: Prof. & Legal Issues in Engr.	3
Basic/Engr. Science Elective: See Remarks	3
Technical Electives: See Remarks	12
Credits	**18**
Second Semester	
Technical Electives: See Remarks	9
Liberal Education Elective: See Remarks	3
Free Elective: See Remarks	3
Credits	**15**

Infrastructure Systems Track

Third Year	
First semester	
Engl 3764 Technical Writing	3
CEE 3684 CEE Materials	3
CEE 3014 Construction Management	3
CEE 3604 Intro. to Transportation Engr.	3
CEE 3104 Intro. to Environmental Engr.	3
CEE 3304 Fluid Mechanics for CEE	3
Credits	**18**
Second semester	
Basic/Engr. Science Elective: See Remarks	3
CEE 3804 Computer Applic. in CEE	3

CEE 3514 Intro. to Geotechnical Engr.	3
IFS Foundation Course	3
Technical Elective: See Remarks	3
Credits	**15**
Fourth Year	
First Semester	
IFS Foundation Course	3
IFS Foundation Course	3
Basic/Engr. Science Elective: See Remarks	3
Liberal Education Elective: See Remarks	3
Technical Electives: See Remarks	6
Credits	**18**
Second Semester	
CEE 4804 Prof. & Legal Issues In Engr.	3
IFS Foundation Course	3
Technical Elective: See Remarks	3
Liberal Education Elective: See Remarks	3
Free Elective: See Remarks	3
Credits	**15**

Structures, Geotechnical, and Construction Track

Third Year	
First Semester	
CEE 3404: Theory of Structures	3
CEE 3014: Construction Management	3
CEE 3514: Intro to Geotechnical Engr	3
ESM 3054: Mech. Behavior of Materials and ESM 3064 Lab	3
CEE 3804: Computer Applications in CEE	3
Credits	**15**
Second Semester	
CEE 3684: CEE Materials	3
CEE 3434: Design of Steel Structures	3
CEE 3304: Fluid Mechanics for CEE	3
Basic/Engr. Science Elective: See Remarks	3
ENGL 3764: Technical Writing	3
Liberal Education Elective: See remarks	3
Credits	**18**
Fourth Year	
First Semester	
CEE 3424: Reinforced Concrete Design	3
CEE 4014 Estimating, Prod., and Cost Engr. or CEE 4024 Const. Control Techniques or CEE 4074 Construction Means & Methods	3
CEE 4514 Methods in Geotechnical Engr. or CEE 4534 Earth Pressures & Foundations	3
Basic/Engr. Science Elective: See Remarks	3
Liberal Education Elective: See remarks	3
Technical Elective: See Remarks	3

Credits	**18**
Second Semester	
CEE 4804: Prof. & Legal Issues in Engr.	3
CEE 3104: Intro. to Environmental Engr. ***or*** CEE 4554: Natural Disaster Mitigation & Recov.	3
Technical Electives: See Remarks	6
Free Elective: See Remarks	3
Credits	**15**

REMARKS:

Curriculum for Liberal Education Remarks: Engineering students entering the university in 1999-2000 or later are required to meet the following Curriculum for Liberal Education requirements, in addition to their college and departmental requirements:

Credits	
ViEWS - met by a designated sequence of required CEE courses and ENGL 3764	6
CLE Area 2: Ideas, Cultural Traditions and Values	6
CLE Area 3: Society and Human Behavior	6
CLE Area 6: Creativity and Aesthetic Experience	1

Basic/Engr. Science Elective Remarks – must be taken from list shown on applicable CEE checksheet.

Technical Elective Remarks – must satisfy departmental requirements as shown on the appplicable CEE checksheet.

Free Elective Remarks - must not duplicate other courses and cannot include courses on College of Engineering not-credit-for-degree list.

IFS Foundation Course Remarks – must be taken from list shown on IFS Track Checksheet

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Undergraduate Course Descriptions (CEE)

2804: INTRODUCTION TO CIVIL AND ENVIRONMENTAL ENGINEERING
Overview of the civil engineering profession and the undergraduate program of study. The fundamentals of good oral and written communication skills for the Civil Engineer are emphasized. An introduction to engineering library resources is also included. Pre: ENGE 1024. (3H,2C) I,II.

2814: CIVIL AND ENVIRONMENTAL ENGINEERING MEASUREMENTS
Introduction to various data measurement issues in civil and environmental engineering, including collection techniques, analysis, error, and statistical evaluation in all sub-disciplines. Spatial measurement topics include GPS, leveling, distance and angular measurement, mapping and topographic surveys, automated data collection, terrain models, earthwork methods, construction surveying, geodesy, and GIS. Pre: BC students required to take the BC 1224 pre-requisite, they are exempt from the co-requisite ENGE 2824. CEE students are required to take the ENGE 1114 pre-requisite. Pre: ENGE 1114 or BC 1224, (MATH 1206 or MATH 1206H), (MATH 1224 or MATH 1224H). Co: ENGE 2824. (3H,3L,4C)

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3014: CONSTRUCTION MANAGEMENT
Fundamental elements involved in managing construction projects. Management structure, construction contracts, equipment and labor productivity, scheduling, quality assurance, and cost control. Junior standing required. (2H,3L,3C) I,II.

3104: INTRODUCTION TO ENVIRONMENTAL ENGINEERING
Overall view of environmental engineering with emphasis on hazardous waste management, water treatment, wastewater treatment, air pollution and its control, solid waste management, groundwater pollution and environmental regulations. A grade of C- or better required in pre-requisites CHEM 1035, 1045, MATH 1205, 1206, and PHYS 2305. I, II. Pre: (CHEM 1035 or CHEM 1074), (CHEM 1045 or CHEM 1084), (MATH 1206 or MATH 1206H or MATH 2016), (PHYS 2305 or PHYS 2205). (3H,3C)

3274: INTRO LAND DEVELOPMENT

An introduction to the land development design process including site selection and feasibility, environmental considerations, utility layout, grading, stormwater management and integrating planning with the design of infrastructure to support residential and commercial development. Pre: 2814. (3H,3C)

3304: FLUID MECHANICS FOR CIVIL AND ENVIRONMENTAL ENGINEERING
Hydrostatics; fluid motion; continuity, momentum, and energy equations; viscous effects; applications to pipe networks and hydraulic systems, including open channel flow. Laboratory experiments and demonstrations. A grade of C- or better in pre-requisite ESM 2104. I,II Pre: ESM 2104. (3H,2L,3C)

3314: WATER RESOURCES ENGINEERING
Open channel flow; hydrology; hydraulic modeling; hydraulic machinery and structures; laboratory experiments and demonstrations. A grade of C- or better required in pre-requisite 3304. Pre: 3304. (3H,2L,3C)

3324 (GEOG 3324): INTRODUCTION TO APPLIED METEOROLOGY
Course emphasizes for the operational aspects of weather prediction and severe storm forecasting. Focus is on surface data analysis, upper air soundings and skew-T diagrams, pressure maps, frontal analysis, atmospheric moisture and its implications for forecasting, Doppler radar and satellite imagery, forecast models, hurricanes, atmospheric instability, convection and thunderstorm life-cycle, forecasting thunderstorm types, tornadoes and severe weather forecasting. (3H,3C)

3404: THEORY OF STRUCTURES
Fundamental tools and methods of structural analysis: moment-area, slope-deflection, force, and moment-distribution methods. Influence lines. Application to beams, trusses, and simple frames. A grade of C- or better required in pre-requisite ESM 2204. I.II Pre: ESM 2204. (3H,3C)

3414 (BSE 3414): DESIGN OF WOOD STRUCTURES
Wood as an engineering material, loads, structural lumber, glulam, plywood, design of single structural elements, combined stress design, fastener design, truss design, pole and post-frame structures, shear wall, and diaphragm design. A grade of C- or better required in pre-requisite ESM 2204. I Pre: ESM 2204, CEE 3404. (3H,3C)

3424: REINFORCED CONCRETE STRUCTURES I
Behavior and design of reinforced concrete members based on ultimate strength. Beams and slabs in flexure, shear and torsion, development of reinforcement. Columns with axial force plus bending, slenderness effects in columns. A grade of C- or better required in pre-requisite 3404. I,II Pre: 3404. (3H,3C)

3434: DESIGN OF STEEL STRUCTURES I
Behavior and design of structural steel members and steel-frame buildings, including simple and fixed connections. AISC specifications; elastic theory. Design members to resist tension, compression, bending, torsion; plate girders, composite beams. ESM 3054 may be taken in place of co-requisite CEE 3684. Pre: 3404. Co: 3684. (2H,3L,3C) I,II.

3514: INTRO TO GEOTECHNICAL ENGR
Engineering properties of soils including their descriptions and classifications, the effects of water, soil strength and compressibility. Introduction to soil stabilization, earth pressures, slope stability, and foundations. A grade of C- or better required in pre-requisites GEOS 2104 and ESM 2204. Pre: ESM 2204, (GEOS 1004 or GEOS 2104 or GEOL 1004 or GEOL 2104). (2H,2L,3C) I, II.

3604: INTRODUCTION TO TRANSPORTATION ENGINEERING
Planning, design and operation of transportation systems with emphasis in multimodal transportation techniques and unified system engineering theories to analyze large scale transportation problems. Discussion of Intelligent Vehicle Highway Systems (IVHS) and hands on experience in computer models in transportation operations and planning. Interactions between transportation infrastructure and environmental engineering planning. Junior standing required. II (3H,3C)

3684: CIVIL ENGINEERING MATERIALS
Characteristics of constituent materials and the design and behavior of portland cement and bituminous concrete mixtures with demonstrated laboratory experiments. Pre: CHEM 1035, CHEM 1045, ESM 2204, CEE 2814, (GEOS 2104 or GEOS 1004). (2H,3L,3C) I,II.

3804: COMPUTER APPLICATIONS FOR CIVIL AND ENVIRONMENTAL ENGINEERS
Introduction to computer applications in civil and environmental engineering. Integration of design, data management, computer programming and problem solving skills with computer tools and techniques. Topics include systems analysis, optimization, database management, computer programming and data structures. Junior Standing Required. (2H,2L,3C) I,II.

4014 (BC 4024): ESTIMATING, PRODUCTION, AND COST ENGINEERING
Interpretation of plans and specifications, preparation of construction estimates, and cost control. Methods analysis, resource requirements, and resource costs in building systems, including system components, and in large-scale civil engineering works such as highways, bridges, and hydraulic structures. A grade of C- or better required in pre-requisite 3014. I,II Co: 3014. (3H,3C)

4024: CONSTRUCTION CONTROL TECHNIQUES
Techniques used to plan, schedule, and control the Construction Process. Emphasizes manual and computer-based approaches. Focuses on an analytical approach towards the construction process whereby good technical methodologies and solutions are converted to reality through construction practices. I Pre: 3014. Co: 4014. (3H,3C)

4064: DESIGN HAZARD CONTROL CONSTRCT
Design of construction projects and systems to control inherent hazards to the health and safety of construction workers, inhabitants of the built environment, and the general public. Regulatory and legal drivers pertinent to construction, chemical and physical health hazards, major classes of

safety hazards, design processes and specifications to control safety and health hazards, system engineering risk analysis tools, and safety management processes. Pre: 3014. (3H,3C)

4074: CONSTRUCTION ENGINEERING: MEANS AND METHODS
Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility. Selection and optimization of individual units as well as the systems needed to produce the required work to the required quality on time and on budget. I (3H,3C)

4104: WATER AND WASTEWATER TREATMENT DESIGN
Design of municipal water and wastewater treatment plants. Emphasis on characterization of water and wastewater and physical, chemical, and biological treatment methods. Sludge processing advanced treatment methods and treatment plant hydraulics are considered. I Pre: 3104, 3304. (3H,3C)

4114: FUNDAMENTALS OF PUBLIC HEALTH ENGINEERING
Public health engineering principles for protection against biological and chemical health hazards. Emphasis on major communicable diseases that plague mankind, organisms that cause them, routes of transmission, and engineering methods of control. Appropriate control methods for rural areas and developing countries. A grade of C- or better required in pre-requisite 3104 or permission of the instructor. Pre: 3104. (3H,3C)

4144: AIR RESOURCES ENGR
Source assessment utilizing instrumentation and EPA reference methods. Calculation of source compliance status. Air quality PC modeling to acquire construction and operating permits. Design of monitoring networks as required by EPA and industry. Design calculations for determining the applicability of control equipment alternatives with emphasis on meeting emission standards in a cost effective manner. A grade of C- or better required in pre-requisite 3104. II (3H,3C)

4164 (BIOL 4164) (CSES 4164) (ENSC 4164): ENVIRONMENTAL MICROBIOLOGY
Ecology, physiology, and diversity of soil and aquatic microorganisms; incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Biology students are exempt from CEE 3104 but must take BIOL 2604 and obtain a C- or higher. Pre: BIOL 2604 or CEE 3104. (2H,3L,3C) II.

4174: SOLID AND HAZARDOUS WASTE MANAGEMENT
Introduction to the problems, regulations and techniques associated with the management of solid and hazardous waste. Composition, volume and characterization of the wastes. Design of collection and disposal systems, including landfills, solidification/stabilization and incineration. A grade of C- or better required in pre-requisite 3104. I Pre: 3104. (3H,3C)

4204: CAD APPLICATIONS IN CIVIL AND ENVIRONMENTAL ENGINEERING
Overview of CAD-based software in civil and environmental engineering. Project design methods and supportive software. Field survey data, surface creation, visualization techniques, grading, piping, roads, CAD standards, software customization. Specific software packages to demonstrate current industry practices. Senior standing required. A grade of C- or better required in pre-requisite 2814. Pre: 2814. (3H,3C)

4264: SUSTAINABLE LAND DEVELOPMENT
An introduction to the modern techniques for developing land while maintaining a focus on long-term sustainability. Topics include site layout, stormwater impact, air quality and microclimate, living resources, LEED and EarthCraft development standards. Pre-requisite: Senior Standing required (3H,3C)

4274: LAND DEVELOP DESIGN
Overview of land development projects including factors, construction practices, legal issues, and government policies. Design project includes feasibility study, engineering evaluation of site, and layout design of lots, buildings, streets, sewers, etc. Interactive graphics and automated drafting. Senior standing in Civil Engineering required. I (2H,3L,3C)

4284: ADV LAND DEVELOPMENT DESIGN
Advanced course in land development design focusing on site grading and parking, stormwater management, and erosion control. Reviews project design criteria and applicable municipal and state guidelines. Uses CAD software for design and deliverables. Senior/Graduate standing required. Co: 4274. (3H,3C)

4304: HYDROLOGY
Precipitation, evaporation, consumptive use, infiltration; stream flow, flood routing; statistical analysis of hydrologic data, flood and drought forecasting, risk analysis, subsurface flow, well hydraulics, introduction to urban drainage design. A grade of C- or better required in pre-requisite 3314. I Pre: 3314. (3H,3C)

4314: GROUNDWATER RESOURCES
Fundamentals of groundwater hydrology; flow through porous media, both saturated and unsaturated; flow to wells in both confined and unconfined aquifers; analysis of recharge basin and field drains; seepage from canals into the groundwater; contaminants in groundwater. A grade of C- or better required in pre-requisite 3304. Pre: 3304. (3H,3C) II.

4324: OPEN CHANNEL FLOW
Mechanics of open channel flow, including uniform flow, gradually varied flow, channel transitions, unsteady flow and fundamentals of sediment transport phenomena. Pre: 3314. (3H,3C)

4334: HYDRAULIC STRUCTURES

Hydraulic analysis and design of engineering structures for water control, including reservoirs, dams, spillways, spilling basins, drainage structures, and hydraulic models. A grade of C- or better required in pre-requisite 3314. II Pre: 3314. (3H,3C)

4344: WATER RESOURCES PLANNING
Analysis of the water resources planning process and the institutional framework for water resources management. Criteria and procedures for evaluating management alternatives are examined, with emphasis on assessment of economic and environmental impacts. Senior standing required. I (3H,3C)

4354: ENVIRONMENTAL HYDROLOGY
Overall view of pollutants movements in surface waters, with emphasis on the role of various hydrologic processes. Natural and constructed wetlands and their use for water quality control. Fundamentals of river hydraulics. Design of flood control channels. Environmental consequences of various types of hydraulic systems. Mitigation, enhancement, and restoration techniques. A grade of C- or better required in pre-requisites 3104 and 3314. II Pre: 3104, 3314. (3H,3C)

4364 (AOE 4064): FLUID FLOWS IN NATURE
Course designed to build upon and broaden a basic traditional engineering knowledge of fluid flows into areas concerning a variety of natural occurrences and phenomena that involve fluid motions in important ways. Drag sessile systems and motile animals, gliding and soaring, flying and swimming, internal flows in organisms, low Reynolds number flows, fluid-fluid interfaces, unsteady flows in nature and wind engineering. I Pre: 3304 or AOE 3014 or ESM 3024 or ME 3404. (3H,3C)

4404: COMPUTER ANALYSIS OF STRUCTURES I
Formulation of matrix displacement method in a form suitable for program development. Application to trusses and frames. Incorporation of special features such as symmetry, internal releases, support settlements, and influence lines. Initiation of program development. Use of existing programs on the personal computer. A grade of C- or better required in pre-requisite 3404. I Pre: 3404. (3H,3C)

4424: DESIGN OF PRESTRESSED CONCRETE STRUCTURES
Principle of prestressing applied to concrete beams, slabs, and frames; design of individual elements and structural systems of prestressed concrete; precast construction and connection design. A grade of C- or better required in pre-requisite 3404 and 3684. I Pre: 3404, 3684, 3424. (3H,3C)

4434: DESIGN OF STEEL STRUCTURES II
Plastic design of steel beams, columns, and connections; elastic design of tension, compression, and flexural members using Load and Resistance Factor Design specifications. A grade of C- or better required in pre-requisite 3434. I,II Pre: 3434. (2H,3L,3C)

4444 (AOE 4054) (ESM 4444): STABILITY OF STRUCTURES
Introduction to the methods of static structural stability analysis and their applications. Buckling of columns and frames. Energy method and approximate solutions. Elastic and inelastic behavior. Torsional and lateral buckling. Use of stability as a structural design criterion. A grade of C- or better required in AOE 3024 or CEE 3404. II Pre: AOE 3024 or CEE 3404. (3H,3C)

4454: MASONRY STRUCTURAL DESIGN
Masonry materials, material testing, material specifications. Structural behavior and design of masonry elements (walls, beams, and columns) and systems used in structures. Construction techniques and the details of masonry construction. Building codes relating to analysis and design of masonry structures. A grade of C- or better required in pre-requisites 3424 and 3684. II Pre: 3684, 3424. (3H,3C)

4474: REINFORCED CONCRETE STRUCTURES II
Behavior and design of continuous reinforced concrete structures subjected to gravity and lateral loads. application of computer programs to frame analysis and design of members. Biaxial bending of columns, two-way floor systems, retaining walls, and footing design problems. Comprehensive design project concludes the course. A grade of C- or better required in pre-requisite 3424. II Pre: 3424. (3H,3C)

4494: COMPUTER METHODS IN STRUCTURAL DESIGN
Design of structural members in steel, concrete, and wood using computers. Design of structural systems. Development of programs for the solution of structural design problems. Senior standing in civil engineering required. A grade of C- or better required in pre-requisites 3424 or 3434. Pre: 3424 or 3434. (3H,3C)

4504: FINITE ELEMENT METHOD IN CIVIL ENGINEERING
Introduction to finite element method as applied to civil engineering problems. One-dimensional stress-deformation, fluid flow, and consolidation problems. Analysis of beam bending and beam-column and torsion problems. Two-dimensional plane strain, plane stress, and axisymmetric analysis of stress-deformation and fluid flow problems. Use of computer codes. Introduction to nonlinear techniques. A grade of C- or better required in pre-requisites 3404 or ESM 3054. I Pre: 3404 or ESM 3054. (3H,3C)

4514: METHODS IN GEOTECHNICAL ENGINEERING
Principles and techniques for characterizing earth materials (soil and rock) for civil engineering projects in various regional environments; with emphasis on the interdisciplinary approach to field exploration and site description through soil mechanics theory, geologic correlations, geophysical methods, in site testing and sampling. A grade of C- or better required in pre-requisite 3514. I Pre: 3514. (3H,3C)

4534: EARTH PRESSURES AND FOUNDATION STRUCTURES
Earth pressure theories and their applications to the design of retaining structures, anchors, and excavation bracing. Bearing capacity and settlement of shallow foundations. Types and capacity of deep foundations. A grade of C- or better in pre-requisite 3514. I,II Pre: 3514. (3H,3C)

4544: APPLIED GEOTECHNICAL ENGINEERING ANALYSIS
Application of geotechnical engineering principles in the design and control of surface and subsurface construction. Excavations, earth fills, slope

stability, geosynthetics and geotechnical aspects of sustainable development. Pre: 3514. (3H,3C)

4554: NATURAL DISASTER MITIGATION AND RECOVERY
Causes, mechanics, classifications, and forces associated with tornadoes, hurricanes, floods, earthquakes, and landslides. Resistance evaluation for existing ground, facilities and structures. Hazard-resistant design of new facilities. Risk and reliability assessment and decision analysis. Strategies and designs for natural disaster risk mitigation. Emergency response for protection of life and property and restoration of lifelines. Includes an interdisciplinary team project. A grade of C- or better required in pre-requisites 3304, 3514 and 3684. II Pre: 3304, 3514, 3684. (3H,3C)

4594 (CSES 4594): SOIL AND GROUNDWATER POLLUTION
Application of mathematical models for chemical movement in soils and groundwater to evaluate soil and groundwater pollutant behavior; discussion of pollution remediation technologies; design of subsurface monitoring networks; case studies in soil and groundwater pollution; applications to landfills, waste spills, septic drainfields, pesticide/fertilizer leaching, and other problems of environmental concern. Pre: MATH 2224 or MATH 2224H or MATH 2016. (3H,3C) I,II.

4604: TRAFFIC ENGINEERING
Study of traffic and parking characteristics; application of traffic control devices; principles and techniques used to improve the efficiency and safety of traffic flow systems. A grade of C- or better required in pre-requisite 3604. I Pre: 3604. (3H,3C)

4614: ADVANCED CIVIL ENGINEERING MATERIALS
Fundamental properties and the physical and chemical aspects of the structure of Portland cement concretes. Emphasis placed on environmental performance aspects and the application of studies of concrete performance under various exposure conditions. A grade of C- or better required in pre-requisite 3684. II Pre: 3684. (3H,3C)

4624: PLANNING TRANSPORTATION FACILITIES
Transportation planning process; urban and regional studies, surveys, data analysis, model development and testing; transportation management, administration, finance, system evaluation, implementation, and integration. A grade of C- or better required in pre-requisite 3604. II Pre: 3604. (3H,3C)

4634: INFRASTRUCTURE CONDITION ASSESSMENT
Infrastructure components and assessment needs; physical and chemical properties of construction materials; deterioration causes, assessment methods, nondestructive evaluation techniques, infrastructure management systems, performance models, service-life-cycle estimates. A grade of C- or better required in pre-requisite 3684. II Pre: 3684. (3H,3C)

4644: TRAFFIC SIGNAL SYSTEM OPERATION AND CONTROL
Traffic signal system control, with emphasis in arterial operation. Signal system design and operations, traffic simulation techniques, advanced traffic control strategies, and incorporation of surface street systems into Intelligent Transportation Systems (ITS). Hands-on experience in signal system software and hardware. Pre: 3604. (3H,3C)

4654: GEOMETRIC DESIGN OF HIGHWAYS
Functional design of highways; curves, intersections, interchanges, drainage, and other features involved in highway safety and traffic efficiency. A grade of C- or better required in pre-requisite 3604. II Pre: 3604. (3H,3C)

4664: PAVEMENT DESIGN
Principles underlying methods for the design of various elements of flexible and rigid pavements for highways and airports; climate and traffic effects; pavement management systems. A grade of C- or better required in pre-requisite 3684. I Pre: 3684. (3H,3C)

4674: AIRPORT PLANNING AND DESIGN
Airport planning and economic justification, site selection, configuration, development and design of terminal areas, demand forecasting, access, traffic control. A grade of C- or better required in pre-requisite 3604. II Pre: 3604.
(3H,3C)

4684: TRANSPORTATION SAFETY
Basic principles associated with transportation safety related to humans, vehicles and infrastructure as well as principles of design for safety and practices of empirical evaluation of safety. Principles and practices of accident investigation and injury epidemiology as well as safeguards and control practices. Pre: 3604, STAT 3704. (3H,3C)

4804: PROFESSIONAL AND LEGAL ISSUES IN ENGINEERING
Analysis of the legal, professional, and ethical aspects of engineering practice; introduction to contract law and contract dispute resolution, professional liability, and other aspects of law relevant to engineering practice; professional registration and codes of ethics. Pre: Senior standing in engineering. (3H,3C) I,II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

College of Engineering

Computer Science

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University Exemplary Department

Barbara G. Ryder,Head and J. Byron Maupin Professor of Engineering
Professors: O. Balci; C. L. Barrett[1]; I. R. Chen; R. W. Ehrich; E. A. Fox; L. S. Heath; D. G. Kafura; M. Marathe[1]; F. Quek; N. Ramakrishnan; C. A. Shaffer; E. Sotelino[2]; L. T. Watson
Associate Professors: J. D. Arthur; D. Bowman; K. W. Cameron; S. H. Edwards; C. J. Egyhazy; W. Feng; W. R. Frakes; D. Gracanin; D. S. McCrickard; C. T. Lu; C. L. North; M. A. Pérez-Quiñones; C. J. Ribbens; A. Sandu; E. E. Santos; J. C. Setubal[1]; D. G. Tatar; S. Varadarajan
Assistant Professors: G. Back; A. Butt; Ya. Cao; Yo. Cao; V. Choi; G. W. Kulczycki; T. M. Murali; A. Onufriev; E. Tilevich; A. Vullikanti[1]; L. Zhang
Research Scientist: S. Harrison
Instructors: N. D. Barnette; W. McQuain
Academic Advisors: T. Arthur; L. Bradford
Professor Emeritus: H. R. Hartson
[1] Joint appointment with Virginia Bioinformatics Institute
[2] Joint appointment with Civil and Environmental Engineering

The Field of Computer Science

In a contemporary world where every educated person must have some knowledge of computers, the Department of Computer Science offers courses to meet a variety of needs. The department offers a bachelor of science program to prepare specialists in the area of computer science itself, a minor in computer science, and individual courses directed to the needs of non-majors who will be using computers as tools in their chosen careers. The department also offers the M.S. and Ph.D. in computer science and the master of information systems (see Graduate Catalog).

As a major, computer science involves far more than just writing computer programs. It is a technically rigorous field that requires a strong background in mathematics. Computer scientists must be good at problem solving. Their work requires the ability to think abstractly and to represent real-world objects and interactions as symbols that can be manipulated by a computer. The field of computer science is characterized by rapid change, with new opportunities emerging every year to improve life in diverse areas such as education, communication, science, commerce and entertainment.

Accreditation and Program Objectives

The bachelor of science degree in Computer Science is accredited by the Computing Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 20120-4012, telephone (410) 347-7700.

Part of the accreditation process is a clear statement of program objectives and desired outcomes for graduates. The objective of the computer science program is to provide majors with a balanced breadth and depth of knowledge in computer science that allows them the choice between continuing their education in graduate school and beginning their professional career, and to excel in either environment.

Desired outcomes for graduates are organized into the following six areas:

- Foundations of computing: ability to apply knowledge of mathematics and science to carry out analysis of computer science problems and design appropriate solutions; ability to use techniques, skills, and modern software development tools

necessary for computing practice.

- Depth of knowledge: ability to identify, formulate, and solve computer science problems; ability to design a computing system to meet desired needs; ability to apply problem-solving strategies to new, unknown, or open-ended situations in computer science.
- Breadth of knowledge: knowledge and understanding of the impact of the many sub-disciplines of computer science.
- Communication skills: ability to function in teams; ability to use written and oral communication skills effectively.
- Professional ethics: understanding of professional and ethical responsibility.
- Lifelong learning: recognition of the need for and ability to engage in lifelong learning; ability to acquire and use the ever-changing technical knowledge required of computing professionals.

Degree Requirements

A total of 123 semester credits are required for graduation. (The details below are for students graduating in 2011.)

The curriculum in computer science is designed to provide a broad general computer science background that will prepare a student either to enter a professional career as a computer scientist or to continue training at the graduate level. All majors take a set of foundational courses in software development, algorithms, and computer organization at the freshmen and sophomore level. Students at the junior and senior level select one theory course, four specialty courses and a capstone course according to their individual interests within the field. In all, a minimum of 43 credit hours of computer science is required: 1705 or 1124, 2104, 2114, 2505, 2506, 3114, 3204, 3304, 3604, two 3000 or 4000 level electives, one 4000 level elective, a CS theory course (4104 or 4114 or 4124), a CS capstone, a one credit senior seminar and an approved technical elective. To qualify for a B.S. degree in Computer Science, a student must earn a “C” (2.0) or better in 1705 or 1124, 2104, 2114, 2505, 2506, and 3114.

Computer science majors are required to take an additional 36 credits distributed over five disciplines. Mathematics comprises 22 of these credits, which include Math 1114, 1205, 1206, 1224, 2214, 2224, 2534, and 3134. CS/Math double majors take 3034 and 3124 in place of 2534 and 3134. Depending on their selection of CS courses, CS majors may need zero or one additional math course to obtain a math minor.

The other specific disciplines represented in the departmental requirements are engineering education, English, statistics, and communication studies. Students must take ENGE 1024 and 1104, Engl 3764, Stat 4705 or 4714, and COMM 2004. The final four additional credits come from taking one more physics or chemistry lab course beyond the two required by the General Engineering requirements.

Opportunities for Majors

The department offers computer science majors the opportunity to enhance their education through a variety of curricular and extracurricular activities. Students who meet the requirements for independent study/ undergraduate research can pursue research or individualized study under the direction of a faculty member. Through the honors program, superior students can work toward earning their degree "in honors" or even elect to earn both the bachelor's and master's degrees within five years. The Cooperative Education Program makes it possible for students to acquire professional experience while pursuing their degree.

The department sponsors chapters of three national computer science organizations. There is a student chapter of the Association for Computing Machinery (ACM), the national professional organization for computer scientists. The Association for Women in Computing (AWC) is dedicated to the advancement of women in information technology fields. The third departmentally sponsored organization is Upsilon Pi Epsilon (UPE), the national computer science honor society. Its members are elected in their junior or senior year. Selection is based on superior academic performance. Additional recognition of student achievements is made during the annual graduation ceremonies. Among the awards given are the Gorsline award, awarded to a rising senior who has overcome freshman-year academic difficulties and subsequently demonstrated great academic achievement.

Information for Non-Majors

The department offers a CS minor for non-majors seeking a strong background in computer science. The requirements for the minor include: 1705 or 1124, 2104, 2114, 2505, 3114, and three credits in a three-hour 3000/4000-level course except 3604, 4004, or 4014. Minors must meet the same prerequisites as majors. This includes Math 2534 as a co-requisite for CS 2505 and achievement of a "C" (2.0) or better in all CS courses which are prerequisites for subsequent CS courses.

Students interested in teacher certification are encouraged to consider the IDST degree program requiring three areas of concentration in Computer Science, Mathematics, and Education. The purpose of the degree is to prepare computer science/mathematics teachers for the secondary schools.

Computational Facilities

The Department of Computer Science possesses extensive facilities for both instruction and research. There are several undergraduate teaching laboratories and a number of specially equipped research laboratories. These include two large parallel computing clusters and numerous computer and file servers for research and instruction in areas such as animation, digital libraries, software engineering,

bioinformatics and networking. The department also operates extensively equipped laboratories for human-computer Interaction, virtual environments and information visualization. These labs include display walls, state-of-the-art 3D and head-mounted displays, and a 4-wall CAVE immersive theater.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics) and toward the degree in computer science.

Satisfactory progress toward the B.S. in Computer Science requires that a Computer Science major must:

1. be registered in at least one 3-credit course required in the major during each on-campus semester of the regular academic year;
2. achieve a GPA of 2.0 or better in the major no later than having attempted 72 hours toward the degree;
3. maintain an overall GPA of 2.3 or better;
4. not take any CS course required in the major more than twice, including attempts ending in course withdrawal; and
5. not repeat more than 3 CS courses required in the major, including attempts ending in course withdrawal.

Undergraduate Course Descriptions (CS)

1004: COMPUTER LITERACY
Introduction to personal computer applications. Overview of basic computer hardware and system software concepts. Projects using various application software packages including word processing, spreadsheets, databases, and graphics (analytical and presentation), using electronic-mail, computer network browsers, and on-line training systems. Not for CS major or minor credit. Duplicates ACIS 1504, ALS 1514. (3H,3C)

1044: INTRODUCTION TO PROGRAMMING IN C
Fundamental concepts underlying software solutions of many problems. Structured data, statement sequencing, logic control, input/output, and functions. The course will be taught using a structured approach to programming. Partially duplicates 1344. (3H,3C) I, II, III, IV.

1054: INTRODUCTION TO PROGRAMMING IN JAVA
This course provides an introduction to object oriented programming using the Java language. Fundamental concepts underlying programming and software solutions to many problems. Structured data, statement sequencing, logic control, classes, objects, methods, instantiation of classes, sending messages to objects. (2H,2L,3C) I, II, III.

1104: INTRODUCTION TO COMPUTER SCIENCE
This course (a) presents the fundamental concepts of computer programming, (b) introduces the history of computing, (c) provides an introduction to and preliminary investigation of the fundamental concepts found throughout the computer science discipline, and (d) overviews computer science subdisciplines such as algorithms, artificial intelligence, computer architecture, human-computer interaction, language translation, operating systems, parallel computation, and software engineering. Co: 1044 or 1344. (3H,3C)

1114: INTRODUCTION TO SOFTWARE DESIGN
Fundamental concepts of programming from an object-oriented perspective. Basic software engineering principles and programming skills in a programming language that supports the object-oriented paradigm. Simple data types, control structures, array and string data structures, basic algorithms, testing and debugging. A basic model of the computer as an abstract machine. Modeling and problem-solving skills applicable to programming at this level. Partially duplicates 1054, 1124, and 1705. Programming experience may be substituted for pre-requisite ENGE 1024 with instructor's permission. Variable credit course. Pre: ENGE 1024.

1124: INTRODUCTION TO MEDIA COMPUTATION
This course teaches fundamental manipulations of digital media as an introduction to computer science. Basic software engineering principles and programming skills are taught with a programming language that supports object-oriented programming. Simple sata types, control structures, array and string data structures and algorithms, testing and debugging. Partially duplicates 1054 and 1705. (2H,2L,3C)

1204: INTERNET AND SYSTEM SOFTWARE
An on-line self-paced tutorial to the Internet and World Wide Web, Program Development Tools, and common applications. Introduction to Web publishing, communication, and searching. Instruction in the use of an integrated program development environment, debugger, and related program development tools. Introduction to spreadsheets, databases, and slide presentation software package. Partially duplicates 1604. Co: 1344, 1044. (1H,1C)

1344: PROGRAMMING IN C
A course designed to build on prior knowledge of a high level programming language and to teach the fundamentals of structured programming in C. Expression, statement, and module level constructs are discussed; programming assignments are used to reinforce concepts and to provide the requisite experience to pursue advanced Computer Science courses. Partially duplicates 1044. Pre: 1014 or 1034. (1H,1C)

1604: INTRODUCTION TO THE INTERNET
Introduces the concepts, software, data organization and issues involved with using networked information. Also covers file formats (as applied in networked hypermedia and multimedia sound/video documents), local and global (Internet) network access, electronic mail, transferring files, network news, the World Wide Web, digital libraries, on-line public access catalogs and electronic journals, CD-ROMs and on-line databases, and commercial and other networks. Partially duplicates 1205. Word processing ability required. (1H,1C) I,II, III.

1614 (ACIS 1614) (BIT 1614): INTRODUCTION TO LIVING IN THE KNOWLEDGE SOCIETY (LIKES)
Introduces computing concepts needed by students to live in the emerging Knowledge Society. Prepares students to take courses in the Curriculum for Liberal education that are part of the pathway with theme Living In the KnowlEdge Society (LIKES) - i.e., the LIKES themed core. Surveys key paradigms of computing, including problem solving, programming, modeling and simulation, and software engineering. Relates these to the Knowledge Society, covering data, information, and knowledge, considering hypermedia, human-computer interaction, presentation, visualization, networking, and communication. Students are prepared to understand the (potential) application of computing to society in general and in their disciplines. (1H,1C)

1704: INTRODUCTION TO DATA STRUCTURES AND SOFTWARE ENGINEERING
Introduces a disciplined approach to problem-solving and emphasizes the utility of software engineering principles applied to programming practices. Also stressed are program design and implementation involving multiple modules, verification of program correctness, and abstract data types and objects such as strings, arrays, sets, linked lists, stacks, queues, and files. Pre: 1044 or 1344. Co: 2304, 1206. (3H,3C)

1705-1706: INTRODUCTION TO OBJECT-ORIENTED DEVELOPMENT
Fundamental concepts of programming from an object-oriented perspective. Basic software engineering principles and programming skills taught with a programming language that supports the object-oriented paradigm. 1705: Simple data types, control structures, array and string data structures and algorithms, testing and debugging. 1706: Detailed coverage of data structures, algorithms, and the methods of object-oriented design and software construction. Design and construction of medium-sized object-oriented programming projects with an emphasis on teamwork and software engineering. Programming experience in C++ or Java may be substituted for ENGE 1024 prerequisite. Must have a C or better in prerequisite CS 1705. Pre: (MATH 1205 or MATH 1526), ENGE 1024 for 1705; 1705 for 1706. (2H,2L,3C) I, II.

1705H-1706H: HONORS INTRODUCTION TO OBJECT-ORIENTED DEVELOPMENT
(2H,2L,3C)

1944: COMPUTER SCIENCE FIRST YEAR SEMINAR
An introduction to academic and career planning for computer science majors. Pass/Fail only. (1H,1C)

2104: INTRODUCTION TO PROBLEM SOLVING IN COMPUTER SCIENCE
This course introduces the student to a broad range of heuristics for solving problems in a range of settings that are relevant to computation. Emphasis on problem-solving techniques that aid programmers and computer scientists. Heuristics for solving problems "in the small" (classical math and word problems), generating potential solutions to "real-life" problems encountered in the profession, problem solving through computation, and problem solving in teams. Programming experience may be substituted for the ENGE 1024 pre-requisite. Pre: ENGE 1024, (MATH 1205 or MATH 1526). (3H,3C)

2114: SOFTWARE DESIGN AND DATA STRUCTURES
A programming-intensive exploration of software design concepts and implementation techniques. Builds on knowledge of fundamental object-oriented programming. Advanced object-oriented software design, algorithm development and analysis, and classic data structures. Includes a team-based, semester-long software project. Co-requisite MATH 1205 may be substituted with MATH 1526. Pre: 1114 or 1124. Co: MATH 1205. (2H,2L,3C)

2204: UNIX
A hands-on introduction to the modern operating system UNIX. Introduction to the basic operating systems concepts employed by UNIX. Students gain experience with basic system usage, system installation and administration, the UNIX programming environment, and system utilities. Duplicates 2304 (UNIX). A grade of C or better required in CS prerequisite 1706. Pre: 1706 or ECE 2574. (2H,2C) I, II. III.

2304: SELF STUDY IN A PROGRAMMING SYSTEM
Guided self-study in a specific programming system, its syntax and applications; based on prior knowledge of the programming process and experience in programming with some high level language; may be taken three times for credit with different system each time; may be taken only twice for CS major or minor credit; systems to be offered may include FORTRAN, COBOL, C, UNIX, LISP. 2304 (UNIX) partially duplicates 1206. A grade of C or better required in CS prerequisite 1706. Pre: 1706. (1C)

2504: INTRODUCTION TO COMPUTER ORGANIZATION
Basic computer organization at the machine language and assembly language level. Digital logic and circuits. Basic components of computer hardware and their implementation. Interaction with the operating system. Alternative computer organizations and implementations. Partially duplicates ECE 2504. A grade of C or better required in CS prerequisites 2204 and 2605. Pre: 2204, 2605. (3H,3C) I,II.

2505-2506: INTRODUCTION TO COMPUTER ORGANIZATION
An introduction to the design and operation of digital computers. Works up from the logic gate level to combinational and sequential circuits, information representation, computer arithmetic, arithmetic/logic units, control unit design, basic computer organization, relationships between high level programming languages and instruction set architectures. Pre: 1114 or 1124 for 2505; 2505, 2114, MATH 2534 for 2506. Co: MATH 2534 for 2505. (3H,3C)

2604: DATA STRUCTURES AND FILE MANAGEMENT
This course extends the concepts of primitive data types by teaching the student a classical set of data structures that pervades both the theoretical and practical domains of computer science. Topics discussed include lists, trees, graphs, searching, sorting, file system organization and access methods. A grade of C or better required in CS prerequisites 2204 and 2704. Pre: 2204, 2704, MATH 2534. (3H,3C)

2605-2606: DATA STRUCTS & OO DEVELOPMENT
Design and implementation of data structures, intermediate software engineering design principles, and object-oriented programming skills. Emphasis on algorithm analysis, design patterns, testing, debugging, and organizing and managing larger problems. 2605: designing, implementing,

and using data structures, introductory algorithm analysis, object-oriented design principles, and low-level design techniques. 2606: Sorting, searching, file processing, indexing, hashing, algorithm analysis, and advanced tree structures. 2605: Must have C or better in prerequisite CS 1706. 2606: Must have C or better in prerequisite 2605. Pre: 1706, MATH 2534 for 2605; 2605 for 2606. 2605: (2H,2L,3C) 2606: (3H,3C) I, II.

2704: ORJECT-ORIENTED SOFTWARE DESIGN AND CONSTRUCTION
Introduces the principles of object-oriented programming with emphasis on objects, classes, inheritance, and polymorphism. A programming language such as C++ is used to apply these principles in several application domains. Also stressed are tools and techniques for testing, debugging, and organizing and managing larger programs. A grade of C or better required in CS prerequisite 1706. Pre: 1706 or ECE 2574. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114: DATA STRUCTURES AND ALGORITHMS
Advanced data structures and analysis of data structure and algorithm performance. Sorting, searching, hashing, and advanced tree structures and algorithms. File system organization and access methods. Course projects require advanced problem-solving, design, and implementation skills. Pre: 2104, 2114, 2505, MATH 2534. (3H,3C)

3204: OPERATING SYSTEMS
Covers the concept of a "process", its abstract and physical representations, its creation, management and scheduling. Study of: a thread process and how it relates to the parent; asynchronous concurrently executing processes, shared memory access, synchronization via semaphores, critical regions and monitors. Additional topics: deadlock prevention, avoidance, and detection, including Banker's Algorithm; memory management strategies including virtual memory; file representation and storage management; and device management. UNIX will be the reference system and the one used for project development and submission. A grade of C or better required in CS prerequisites 2504, and CS (2604 or 2606). X-grade allowed. Pre: (2504 or ECE 2504), (CS 2604 or CS 2606). (3H,3C) I, II.

3214: COMPUTER SYSTEMS
Introduction to computer systems as they are relevant to application programmers today, with emphasis on operating system principles. Operating system design and architectures; processes; threads, synchronization techniques, deadlock; CPU scheduling; system call interfaces, system level I/O and file management; shell programming; separate compilation, loading and linking; inter-process communication (IPC); virtual and physical memory management and garbage collection; network protocols and programming; virtualization; performance analysis and optimization. Pre: 2506, 2114. (3H,3C)

3304: COMPARATIVE LANGUAGES
This course in programming language constructs emphasizes the run-time behavior of programs. The languages are studied from two points of view: (1) the fundamental elements of languages and their inclusion in commercially available systems; and, (2) the differences between implementations of common elements in languages. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C) I,II.

3414 (MATH 3414): NUMERICAL METHODS
Computational methods for numerical solution of non-linear equations, differential equations, approximations, iterations, methods of least squares, and other topics. Partially duplicates Math 4554. A grade of C or better required in CS prerequisite 1044 or 1705. Pre: MATH 2214, MATH 2224, CS 1044 or CS 1705. (3H,3C) II.

3604: PROFESSIONALISM IN COMPUTING
Studies the ethical, social, and professional concerns of the computer science field. Covers the social impact of the computer, implications and effects of computers on society, and the responsibilities of computer professionals in directing the emerging technology. The topics are studied through case studies of reliable, risk-free technologies, and systems that provide user friendly processes. Specific studies are augmented by an overview of the history of computing, interaction with industrial partners and computing professionals, and attention to the legal and ethical responsibilities of professionals. This is a web-supported course, incorporating writing intensive exercises, making extensive use of active learning technologies. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: COMM 2004, CS 2604 or CS 2606. (3H,3C) I, II.

3704: INTERMEDIATE SOFTWARE DESIGN AND ENGINEERING
Explores the principles of software design in detail, with an emphasis on software engineering aspects. Includes exposure of software lifecycle activities including design, coding, testing, debugging, and maintenance, highlighting how design affects these activities. Peer reviews, designing for software reuse, CASE tools, and writing software to specifications are also covered. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C) I, II.

3724: INTRODUCTION TO HUMAN-COMPUTER INTERACTION
Survey of human-computer interaction concepts, theory, and practice. Basic components of human-computer interaction. Interdisciplinary underpinnings. Informed and critical evaluation of computer-based technology. User-oriented perspective, rather than system-oriented, with two thrusts: human (cognitive, social) and technological (input/output, interactions styles, devices). Design guidelines, evaluation methods, participatory design, communication between users and system developers. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C) I, II.

3744: INTRO GUI PROGRAMMING/GRAPHICS
Design and implementation of object-oriented graphical user interfaces (GUI) and two-dimensional computer graphics systems. Implementation

methodologies including callbacks, handlers, event listeners, design patterns, layout managers, and architectural models. Mathematical foundations of computer graphics applied to fundamental algorithms for clipping, scan conversion, affine and convex linear transformations, projections, viewing, structuring, and modeling. Pre: 2114, MATH 1224, MATH 1114. (3H,3C)

3824: INTRODUCTION TO COMPUTATIONAL BIOLOGY AND BIOINFORMATICS
Introduction to computational biology and bioinformatics (CBB) through hands-on learning experiences. Emphasis on problem solving in CBB. Breadth of topics covering structural bioinformatics; modeling and simulation of biological networks; computational sequence analysis; algorithms for reconstructing phylogenies; computational systems biology; and data mining algorithms. Pre-requisite: Grade of C or better in CS 2204 and CS 2606 Pre: 2204, 2606. (3H,3C)

4004: DATA AND INFORMATION STRUCTURES
Formal underpinnings of computer science: logic, sets, relations as they apply to computer science. Principles of data structures, algorithm analysis, file management, databases. Not for CS major or minor credit; not for graduate credit in CSA program. Pre: 1704. (3H,3C)

4014: PRINCIPLES OF COMPUTER ARCHITECTURE AND OPERATING SYSTEMS
Principles of computer hardware organization and operating systems. From individual microprocessor hardware components to computer network architectures. Operating system principles, with emphasis on concurrency and synchronization, deadlock, memory, scheduling and performance. Not for CS major or minor credit; not for graduate credit in CSA program. Pre: 4004. (3H,3C) II.

4104: DATA AND ALGORITHM ANALYSIS
This course emphasizes the understanding of data structures and algorithms from an analytical perspective rather than from an implementation standpoint. The concepts developed allow discussion of the efficiency of an algorithm and the comparison of two or more algorithms with respect to space and run-time requirements. Analytical methods are used to describe theoretical bounds as well as practical ones. In general, this course addresses the constraints that affect problem solvability. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: (2604 or 2606), (MATH 3134 or MATH 3034). (3H,3C) I, II.

4114: INTRODUCTION TO FORMAL LANGUAGES AND AUTOMATA THEORY
The course presents a study of formal languages and the correspondence between language classes and the automata that recognize them. Formal definitions of grammars and acceptors, deterministic and nondeterministic systems, grammar ambiguity, finite state and push-down automata, and normal forms will be discussed. Pre: MATH 3134 or MATH 3034. (3H,3C) II.

4124: THEORY OF COMPUTATION
Theoretical analysis of the computational process; fundamental concepts such as abstract programs, classes of computational machines and their equivalence, recursive function theory, unsolvable problems, Church's thesis, Kleene's theorem, program equivalence, and generability, acceptability, decidability will be covered. I Pre: MATH 3134 or MATH 3034. (3H,3C)

4204: COMPUTER GRAPHICS
Hardware and software techniques for the display of graphical information. 2D and 3D geometry and transformations, clipping and windowing, software systems. Interactive graphics, shading, hidden surface elimination, perspective depth. Modeling and realism. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C) I, II.

4214: SIMULATION AND MODELING
Overview of discrete-event digital computer simulation and modeling. Fundamentals of model development, Monte Carlo simulation, the life cycle of a simulation study, input and output data analysis, world views and time control, random number and variate generation, credibility assessment of simulation results, simulation languages, applications of simulation using the General Purpose Simulation System (GPSS). A grade of C or better required in CS prerequisite 1706. Pre: 1706, STAT 4714. (3H,3C)

4224: PERFORMANCE EVALUATION OF COMPUTER SYSTEMS
Overview of techniques for measuring, improving, and tuning the performance of computer systems. Procurement, workload characterization, measurement principles, the representation of measurement data, software and hardware monitors, capacity planning, bottleneck detection, system and program tuning, simulation and analytic models and their applications, case studies. Pre: 3204, (STAT 4714 or STAT 4105 or STAT 4705). (3H,3C)

4234: PARALLEL AND DISTRIBUTED COMPUTATION
Survey of parallel computer architectures, models of parallel computation, and interconnection networks. Parallel algorithm development and analysis. Programming paradigms and languages for parallel computation. Example applications. Performance measurement and evaluation. A grade of C or better required in CS prerequisite 3204. I Pre: 3204. (3H,3C)

4244: INTERNET SOFTWARE DEVELOPMENT
Key technology underlying the World-Wide Web. Web architecture, including client and server design, network protocols, and related standards. Static and dynamic content, caching, state management, fault tolerance, error handling. Programming systems and abstractions, e.g., sockets, remote procedures, Web services, frameworks and component models. Document representations and processing. Security. Entrepreneurial issues and emerging technologies. A grade of C or better required in CS 3204 prerequisite. Pre: 3204 or 3204. (3H,3C)

4254: COMPUTER NETWORK ARCHITECTURE AND PROGRAMMING
Introduction to computer network architecture, and methods for programming network services and applications (e.g. DNS, Email and MIME, http, SNMP, multimedia). Wired, wireless, and satellite network architectures. OSI protocol model, with an emphasis on upper layers. Congestion control, quality of service, routing. Internet protocol suite (e.g. IP, TCP, ARP, RARP). Server design (e.g. connectionless, concurrent). Network programming abstractions (e.g. XDR, remote procedure calls, sockets, DCOM). Case studies (e.g. TELNET). A grade of C or better required in CS prerequisite 3204. Pre: 3204. (3H,3C) II.

4304: COMPILER DESIGN AND IMPLEMENTATION
This course includes the theory, the design, and the implementation of a large language translator system. Lexical analysis, syntatic analysis, code generation, and optimization are emphasized. A grade of C or better required in CS prerequisite 3204. Pre: 3204. (3H,3C) II.

4414 (MATH 4414): ISSUES IN SCIENTIFIC COMPUTING
Theory and techniques of modern computational mathematics, computing environments, computational linear algebra, optimization, approximation, parameter identification, finite difference and finite element methods and symbolic computation. Project-oriented course; modeling and analysis of physical systems using state-of-the-art software and packaged subroutines. Pre: MATH 2214, MATH 3214. (2H,3L,3C)

4504 (ECE 4504): COMPUTER ORGANIZATION
Information representation and transfer; instructions and data access methods; the control unit and microprogramming; memories; input/output and interrupts; secondary storage; the von Neumann SISD organization; high level language machines; the RISC concept; special purpose processors including operating system, file, text, floating point, communication, etc. Multicomputers; multiprocessors; concurrent processing support; Pipeline machines, processor arrays, database machines; the data flow/data directed approach; computer networks. A grade of C or better required in CS prerequisite 3204. Pre: 3204. (3H,3C) I,II.

4570 (ECE 4570): WIRELESS NETWORKS AND MOBILE SYSTEMS
Multidisciplinary, project-oriented design course that considers aspects of wireless and mobile systems including wireless networks and link protocols, mobile networking including support for the Internet Protocol suite, mobile middleware, and mobile applications. Students complete multiple experiments and design projects. Pre: 4254 or ECE 4564. (3H,3C)

4604: INTRODUCTION TO DATA BASE MANAGEMENT SYSTEMS
Emphasis on introduction of the basic data base models, corresponding logical and physical data structures, comparisons of models, logical data design, and data base usage. Terminology, historical evolution, relationships, implementation, data base personnel, future trends, applications, performance considerations, data integrity. Senior standing required. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C) II.

4624: MULTIMEDIA, HYPERTEXT AND INFORMATION ACCESS
Introduces the architectures, concepts, data, hardware, methods, models, software, standards, structures, technologies, and issues involved with: networked multimedia information and systems, hypertext and hypermedia, networked information videoconferencing, authoring/electronic publishing, and information access. Coverage includes how to capture, represent, link, store, compress, browse, search, retrieve, manipulate, interact with, synchronize, perform, and present: text, drawings, still images, animations, audio, video, and their combinations (including in digital libraries). Pre: 2606. (3H,3C)

4634: DESIGN OF INFORMATION
Survey of the higher-order properties that allow data to become information, that is, to inform people. The course focuses on the design of user interface layouts, and on the design of texts and hypertexts, as well as on the information development process. Senior standing required. A grade of C or better required in CS prerequisite 2604 or 2606. Pre: 2604 or 2606. (3H,3C)

4644: CREATIVE COMPUTING STUDIO
Capstone computer science course at the intersection of arts and technology. Intensive immersion in different approaches to digital arts such as game design, interactive art, digital music, and immersive virtual reality. Students work in teams to conduct an end-to-end integrative design project. Pre: 3724. (3H,3C)

4704: SOFTWARE ENGINEERING
Introduction to the basic principles of software engineering. Issues in the software life cycle. Emphasis on methods for software design and testing. Project management and quality assurance. Significant software project required. A grade of C or better required in CS prerequisite 3704 I Pre: 3704. (2H,3L,3C)

4804: INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Overview of the areas of problem solving, game playing, and computer vision. Search trees and/or graphs, game trees, block world vision, syntactic pattern recognition, object matching, natural language, and robotics. Senior standing required. A grade of C or better required in CS prerequisite 2604 or 2606. I Pre: 2604 or 2606. (3H,3C)

4944: SEMINAR
Pass/Fail only. (1H,1C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Architecture and Urban Studies and College of Engineering

Myers-Lawson School of Construction

www.mlsoc.vt.edu

Director: Yvan Beliveau
Associate Director: Michael Garvin
Assistant Director of Undergraduate Studies and Outreach: Christine Fiori
Primary Faculty: C. Fiori; M. Garvin; D. Young
Core Faculty:
Dept. of Building Construction: Y. Beliveau; K. Ku; T. Mills; A. Pearce; G. Reichard; W. Thabet
Vecellio Construction Engineering & Management Program in the Dept. of Civil & Env. Engineering: J. de la Garza; S. Sinha; M. Vorster
Industrial & Systems Engineering: B. Kleiner

Construction Engineering and Management Program

Overview

The Myers-Lawson School of Construction offers students in the College of Engineering a Bachelor of Science Degree in Construction Engineering and Management. This degree is designed for students who wish to pursue a career in the construction industry. The undergraduate program facilitates the development of critical technical, managerial and professional knowledge and skills required for entry into the construction industry or graduate studies. This body of knowledge includes the decision and optimization methods required to integrate and manage the resources essential to construction operations along with the skills that support the development of safe, ethical, socially responsible, and sustainable solutions for the built environment.

Construction managers plan, direct, and coordinate construction projects, including the building of all types of residential, commercial, and industrial structures, roads, bridges, and other public works projects. Construction managers coordinate and supervise the construction process from the conceptual development stage through final construction, ensuring the project is completed within time and budget constraints and is compliant with building and safety codes and other regulations.

The focus of this degree is construction management with engineering and business management as additional major areas of study. The degree retains an emphasis on engineering, with a focus on construction theory and applications, while providing students the opportunity to define the areas of business management they wish to study to complement their career goals.

Coursework capitalizes upon established excellence in the Via Department of Civil and Environmental Engineering, the Department of Building Construction and the Pamplin College of Business. The majority of courses are drawn from existing curricula in Civil Engineering and Building Construction. Complementary courses from the College of Business provide the balance.

Consistent with the general program goal of facilitating development of student competence necessary for entry into the construction industry or graduate school, the School has developed the following program objectives:

Within a few years of curriculum completion, graduates of the Construction Engineering and Management program should be able to combine skills gained through academic preparation and post-graduation experience so that they can:

- Identify, design, analyze, integrate and manage the technical, material, financial, legal and personnel administration aspects that support construction operations, projects and organizations throughout the project lifecycle, i.e., from programming to decommissioning.
- Incorporate safety, efficiency, cost effectiveness, environmental sensitivity and social awareness into the development, planning and implementation of construction operations and processes.

- Apply skills of effective communication, entrepreneurship, teamwork, values-based leadership, professional and ethical behaviors that are the necessary compliment to technical competence.
- Continue their professional development and learning which may include professional licensure or certification, graduate level education, continuing education courses, self-directed study and active involvement in the construction community.

Classroom instruction in the construction engineering and management program is reinforced by instructional laboratories, field trips and guest lectures by leading construction professionals. The department seeks to employ the latest educational technology and innovative teaching methods.

Students in the School have the opportunity to participation in a summer internship program during which they may apply the concepts learned in the classroom in real world applications. The School encourages all students to participate in professional work experience prior to graduation.

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Class Size Limitation

A proposal to limit enrollment in the BS CEM degree has been approved by University governance. The proposal limits enrollment to 40 students per year. The criteria that must be met in order to gain entry into the program include the following three inputs, weighted accordingly:

1. Overall GPA. (60%)
2. The grade obtained for a statement of intent outlining career objectives and experience in the construction industry prepared and submitted to a three person faculty committee. (20%)
3. The grade obtained in an interview to determine commitment to success with a two person faculty committee. (20%)

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Accreditation and Registration

The Construction Engineering and Management degree will seek accreditation by the Engineering Accreditation Commission of ABET after the first class has graduated in May 2009. Accreditation, if successful, is applied retroactively within a two-year period, therefore students graduating in May 2009 will benefit from successful accreditation in the same manner as future classes.

The Virginia State Board of Registration has granted permission for seniors studying towards the BS CEM degree to sit for the Fundamentals of Engineering (FE) exam during the 2008/2009 academic year in anticipation of ABET EAC accreditation.

The contact person for the undergraduate Construction Engineering and Management program is Dr. Christine Fiori, at 540/239-3389 or e-mail: cfiori@vt.edu.

Construction Engineering and Management Program (for 2010)

Note: Graduation requires a total of 133 semester credits. Requirements are subject to change; prospective students should contact the department prior to initiating individual programs of study.

First Year	
First Semester	
CHEM 1035: General Chemistry or CHEM 1074: Chemistry for Engineers	3
CHEM 1045: General Chemistry Lab or CHEM 1084: Chemistry for Engineers Lab	1
MATH 1205: Calculus	3
MATH 1114: Linear Algebra	2
ENGL 1105: Freshman English	3
ENGE 1024: Engr. Exploration	2
Liberal Education Elective: See remarks	1
Credits	15
Second Semester	
PHYS 2305: Foundations of Physics I	4

MATH 1206: Calculus	3
MATH 1224: Vector Geometry	2
ENGL 1106: Freshman English	3
ENGE 1114 Exploration of Engineering or ENGE 1104 Exploration of Digital Future	2
Liberal Education Elective: See remarks	3
Credits	17
Second Year	
First Semester	
PHYS 2306: Foundations of Physics I	4
MATH 2224: Multivariable Calculus	3
ESM 2104: Statics	3
GEOS 2104: Elements of Geology	3
CEE 2804: Intro. to CEE	2
ENGE 2824: CEE Drawings & CAD	1
Credits	16
Second Semester	
STAT 3704: Statistics for Engr. Applications	2
MATH 2214: Differential Equations	3
ESM 2204: Mech. of Deformable Bodies	3
ISE 2014: Engineering Economy	2
CEE 2814: CEE Measurements	4
Liberal Education Elective: See remarks	3
Credits	17
Third Year	
First Semester	
CEE 3404: Theory of Structures	3
CEE 3014: Construction Management	3
CEE 3514: Intro to Geotechnical Engr	3
CEE 3804: Computer Application in CEE	3
CEE 4014: Estimating	3
CEE 4074: Construction Means & Methods	3
Credits	18
Second Semester	
CEE 3684: CEE Materials	3
CEE 3434: Design of Steel Structures	3
BC 4014: Building Systems Tech II	3
BC 3064: Building Systems Tech Lab	2
ENGL 3764: Technical Writing	3
ECON 2005: Principles of Economics	3
Credits	17
Fourth Year	
First Semester	
CEE 3424: Reinforced Concrete Design	3
CEE 4024: Const. Control Techniques	3
CEE Technical Elective: See Remarks	3
BC 4434: Construction Practice I	3
ECON 2006: Principles of Economics	3
Business Elective: See Remarks	3
Credits	18
Second Semester	
CEE 4804: Prof. & Legal Issues in Engr.	3

CEE 3104: Intro. to Environmental Engr. or CEE 4554: Natural Disaster Mitigation & Recov.	3
BC 4444: Construction Practice II	4
BC4064: Construction Practice Lab	2
Business Elective: See Remarks	3
Credits	15

REMARKS:
Curriculum for Liberal Education Remarks: Engineering students entering the university in 1999-2000 or later are required to meet the following Curriculum for Liberal Education requirements, in addition to their college and departmental requirements:

Credits	
ViEWS - met by a designated sequence of required CEM courses and ENGL 3764	6
CLE Area 2: Ideas, Cultural Traditions and Values	6
CLE Area 3: Society and Human Behavior	6
CLE Area 6: Creativity and Aesthetic Experience	1

Business Electives – must be taken from list shown on applicable CEM checksheet.

CEE Technical Elective Remarks – must satisfy departmental requirements as shown on the appplicable CEE checksheet.

Undergraduate Course Descriptions

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

Undergraduate Course Descriptions within the CEM Major

Building Construction (BC)

3064: BUILDING SYSTEMS TECHNOLOGY LAB
Develop a competency in the application of Building Environmental Systems, through modeling, scheduling, estimating, and experiments in support of a senior capstone project. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 4014, CEE 3014, CEE 4074. (1H,2L,2C)

4014: BUILDING SYSTEMS TECHNOLOGY II
This course places an emphasis on the physical installation and integration of passive and active environmental control systems including: heating, ventilation, air conditioning, lighting, acoustics and plumbing. Lectures by faculty and seminars by construction industry practitioners address issues that are relevant to illustrating the applications resulting from theory studied in BC 4004. Pre: (4004 or CEE 2814), PHYS 2306. Co: 2044, 3064, CEE 3014, CEE 4074. (2H,3L,3C)

4064: CONSTRUCTION PRACTICE LAB
Application of the business and construction practices related to operation of a construction company to the execution of a senior capstone project. All project management concepts learned in prior courses are applied in the capstone lab experience. Written and oral work is formally presented and critiqued among construction faculty, students, and industry professionals. Pre: 4434. Co: 4444. (1H,2L,2C)

4434: CONSTRUCTION PRACTICE I
Business and construction practices related to operation of a construction company are studied. Construction law is examined as it relates construction, financial and personnel management. Project management topics studied in this course include permitting, site evaluations, design development and design phase considerations such as preliminary estimates and project constructability. Writing Intensive (WI) course. I Pre: (4014, 3064), (2044 or CEE 3014, CEE 4074). (3H,3C)

4444: CONSTRUCTION PRACTICE II
This course explores and applies the business and construction practices related to operation of a construction company to a capstone experience. Construction law is examined as it relates to construction, financial and personnel management. Project management topics studied in this course are applied in the corequisite lab. This course is formally designated as a writing intensive course. Formal written and edited and oral presentations are presented and critiqued by the BC faculty team, the writing resource center, students and industry

professionals. Pre: 4434. Co: 4064. (3H,3L,4C) II.

Civil and Environmental Engineering (CEE)

2804: INTRODUCTION TO CIVIL AND ENVIRONMENTAL ENGINEERING
Overview of the civil engineering profession and the undergraduate program of study. The fundamentals of good oral and written communication skills for the Civil Engineer are emphasized. An introduction to engineering library resources is also included. Pre: ENGE 1024. (3H,2C) I,II.

2814: CIVIL AND ENVIRONMENTAL ENGINEERING MEASUREMENTS
Introduction to various data measurement issues in civil and environmental engineering, including collection techniques, analysis, error, and statistical evaluation in all sub-disciplines. Spatial measurement topics include GPS, leveling, distance and angular measurement, mapping and topographic surveys, automated data collection, terrain models, earthwork methods, construction surveying, geodesy, and GIS. Pre: BC students required to take the BC 1224 pre-requisite, they are exempt from the co-requisite ENGE 2824. CEE students are required to take the ENGE 1114 pre-requisite. Pre: ENGE 1114 or BC 1224, (MATH 1206 or MATH 1206H), (MATH 1224 or MATH 1224H). Co: ENGE 2824. (3H,3L,4C)

3014: CONSTRUCTION MANAGEMENT
Fundamental elements involved in managing construction projects. Management structure, construction contracts, equipment and labor productivity, scheduling, quality assurance, and cost control. Junior standing required. (2H,3L,3C) I,II.

3104: INTRODUCTION TO ENVIRONMENTAL ENGINEERING
Overall view of environmental engineering with emphasis on hazardous waste management, water treatment, wastewater treatment, air pollution and its control, solid waste management, groundwater pollution and environmental regulations. A grade of C- or better required in pre-requisites CHEM 1035, 1045, MATH 1205, 1206, and PHYS 2305. I, II. Pre: (CHEM 1035 or CHEM 1074), (CHEM 1045 or CHEM 1084), (MATH 1206 or MATH 1206H or MATH 2016), (PHYS 2305 or PHYS 2205). (3H,3C)

3404: THEORY OF STRUCTURES
Fundamental tools and methods of structural analysis: moment-area, slope-deflection, force, and moment-distribution methods. Influence lines. Application to beams, trusses, and simple frames. A grade of C- or better required in pre-requisite ESM 2204. I.II Pre: ESM 2204. (3H,3C)

3424: REINFORCED CONCRETE STRUCTURES I
Behavior and design of reinforced concrete members based on ultimate strength. Beams and slabs in flexure, shear and torsion, development of reinforcement. Columns with axial force plus bending, slenderness effects in columns. A grade of C- or better required in pre-requisite 3404. I,II Pre: 3404. (3H,3C)

3434: DESIGN OF STEEL STRUCTURES I
Behavior and design of structural steel members and steel-frame buildings, including simple and fixed connections. AISC specifications; elastic theory. Design members to resist tension, compression, bending, torsion; plate girders, composite beams. ESM 3054 may be taken in place of co-requisite CEE 3684. Pre: 3404. Co: 3684. (2H,3L,3C) I,II.

3514: INTRO TO GEOTECHNICAL ENGR
Engineering properties of soils including their descriptions and classifications, the effects of water, soil strength and compressibility. Introduction to soil stabilization, earth pressures, slope stability, and foundations. A grade of C- or better required in pre-requisites GEOS 2104 and ESM 2204. Pre: ESM 2204, (GEOS 1004 or GEOS 2104 or GEOL 1004 or GEOL 2104). (2H,2L,3C) I, II.

3684: CIVIL ENGINEERING MATERIALS
Characteristics of constituent materials and the design and behavior of Portland cement and bituminous concrete mixtures with demonstrated laboratory experiments. Pre: CHEM 1035, CHEM 1045, ESM 2204, CEE 2814, (GEOS 2104 or GEOS 1004). (2H,3L,3C) I, II.

3804: COMPUTER APPLICATIONS FOR CIVIL AND ENVIRONMENTAL ENGINEERS
Introduction to computer applications in civil and environmental engineering. Integration of design, data management, computer programming and problem solving skills with computer tools and techniques. Topics include systems analysis, optimization, database management, computer programming and data structures. Junior Standing Required. (2H,2L,3C) I,II.

4014 (BC 4024): ESTIMATING, PRODUCTION, AND COST ENGINEERING
Interpretation of plans and specifications, preparation of construction estimates, and cost control. Methods analysis, resource requirements, and resource costs in building systems, including system components, and in large-scale civil engineering works such as highways, bridges, and hydraulic structures. A grade of C- or better required in pre-requisite 3014. I,II Co: 3014. (3H,3C)

4024: CONSTRUCTION CONTROL TECHNIQUES
Techniques used to plan, schedule, and control the Construction Process. Emphasizes manual and computer-based approaches. Focuses on an analytical approach towards the construction process whereby good technical methodologies and solutions are converted to reality through construction practices. I Pre: 3014. Co: 4014. (3H,3C)

4074: CONSTRUCTION ENGINEERING: MEANS AND METHODS
Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility.

Selection and optimization of individual units as well as the systems needed to produce the required work to the required quality on time and on budget. I (3H,3C)

4554: NATURAL DISASTER MITIGATION AND RECOVERY
Causes, mechanics, classifications, and forces associated with tornadoes, hurricanes, floods, earthquakes, and landslides. Resistance evaluation for existing ground, facilities and structures. Hazard-resistant design of new facilities. Risk and reliability assessment and decision analysis. Strategies and designs for natural disaster risk mitigation. Emergency response for protection of life and property and restoration of lifelines. Includes an interdisciplinary team project. A grade of C- or better required in pre-requisites 3304, 3514 and 3684. II Pre: 3304, 3514, 3684. (3H,3C)

4804: PROFESSIONAL AND LEGAL ISSUES IN ENGINEERING
Analysis of the legal, professional, and ethical aspects of engineering practice; introduction to contract law and contract dispute resolution, professional liability, and other aspects of law relevant to engineering practice; professional registration and codes of ethics. Pre: Senior standing in engineering. (3H,3C) I,II.

College of Engineering

Electrical and Computer Engineering

www.ece.vt.edu/

Scott F. Midkiff: Head and Professor
University Distinguished Professor: F. C. Lee
University Distinguished Professor Emeritus: A. G. Phadke
Alumni Distinguished Professor: C. W. Bostian
American Electric Power Professor: D. Boroyevich
Bradley Professor of Communications: W. H. Tranter
Bradley Distinguished Professor of Electromagnetics: G. S. Brown
Clayton Ayre Professor: A. Wang
Joseph R. Loring Professor in ECE: S. Rahman
Willis G. Worcester Professor in ECE: J. H. Reed
Thomas Phillips Professor, Emeritus: W. L. Stutzman
Virginia Microelectronics Consortium Chair: M. K. Orlowski
Professor Emeritus: J. R. Armstrong; I. M. Besieris; D. A. deWolf; F. G. Gray; F. W. Stephenson; J. S. Thorp; H. F. VanLandingham
Associate Professor Emeritus: R. W. Conners; W. R. Cyre; R. L. Moose; C. E. Nunnally
Professors: P. M. Athanas; A. A. Beex; D. Boroyevich; R. P. Broadwater; C. R. Clauer; W. A. Davis; D. S. Ha; R. Hendricks; M. Hsiao; M. T. Jones; J. S. Lai; Y. Liu; G. Q. Lu; S. F. Midkiff; L. M. Mili; K. Ngo; P. Plassman; T. C. Poon; T. Pratt; S. Rahman; S. Raman; K. Ramu; J. H. Reed; S. M. Riad; A. Safaai-Jazi; W. A. Scales ; J. G. Tront; A. Wang; Y. Wang
Associate Professors: A. L. Abbott; S. Bailey; W. T. Baumann; R. M. Buehrer; V. A. Centeno; L. A. DaSilva; S. W. Ellingson; L. J. Guido; J. De La Ree Lopez; M. Eltoweissy; T. Hou; D. K. Lindner; T. L. Martin; K. Meehan; W. G. Odendaal; J-M Park; C. D. Patterson; J. Paul; B. Ravindran; J. M. Ruohoniemi; S. K. Shukla; D. J. Stillwell; K. S. Tam; F. Wang; C. L. Wyatt; J. Xuan
Assistant Professors: Assistant Professors: M. Agah; J. B. Baker; C. DaSilva; C. Huang; A. B. MacKenzie; L. Nazhandali; P. Schaumont; Y. Xu; Y. Yang
Instructors: K. L. Cooper; L. Pendleton; G. F. Reid; J. Thweatt

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Overview

Almost every effort that uses technology and science to make the world a better place relies on electrical and computer engineers (ECEs). Biologists studying life at the atomic level need ECEs to develop the measurement systems that do not harm fragile cells, sensors that detect and communicate behavior, and processors to understand all the data collected. Doctors rely on ECEs to develop ever-improving medical imaging. Efforts to monitor water pollution use underwater robots, sensors, and control systems developed by ECEs. Art and entertainment are continually enhanced by ECEs who create new ways to listen to music, play games, or communicate with friends. And the possibilities keep growing.

Electrical and computer engineers contribute to so many different efforts by harnessing energy – such as light, sound, electricity and electromagnetic fields – and information (data, modeling, simulation, algorithms, control). Armed with a degree in electrical or computer engineering, Virginia Tech graduates make a difference every day by developing systems that are more energy efficient, less expensive, and easier to use – and by developing methods to solve the problems of the future.

ECE students in the Bradley Department of Electrical and Computer Engineering learn from faculty who create new methods and technology and bring the excitement of their discoveries to the classroom. Engineers want to make things that work and ECE students get hands-on opportunities to build systems from the very beginning of their studies. In the freshman year, students start exploring the applications of electrical and computer engineering, such as medical imaging and cryptography. In the sophomore year, they use personal, portable equipment and components to build and explore simple systems, which become more complex each semester. Laboratories and team projects throughout the curriculum contribute to a solid hands-on experience.

Since ECE is one of the most dynamic and fastest changing fields in engineering, the faculty has crafted a program of study that provides each graduate with a firm foundation in the mathematical and physical basics and a broad experience of many areas of ECE. This enables our graduates to excel in their specialties, while gaining the tools to adapt to the technical and career changes they will face in the future. ECE students also develop the skills to communicate with other engineers and non-engineers.

Undergraduate students can enhance their education by participating in multidisciplinary projects, internships, research, study abroad, and mentorship progams. The Cooperative Education Program (co-op), which alternates semesters of study and professional employment, is recommended, as is participation in ECE professional societies, including the IEEE and the ACM. ECE offers a number of scholarships for academic excellence and leadership, as well as participation in special academic programs, such as a minor in microelectronics and a power electronics option.

ECE offers bachelor of science degrees in electrical engineering (EE) and computer engineering (CPE). The difference is one of emphasis. EEs concentrate more on physical processes and design in communications, power, systems and controls, electronics, electromagnetics, and computing. Computer engineering emphasizes the development of computer hardware and software systems, such as networks, embedded systems, automation, and machine intelligence. A 5-year B.S./M.S. program and M.S. and Ph.D. programs are available.

Computer Engineering Program (CPE)

This program applies to students graduating in 2010

Total credits to graduate: 131 (see comments below)

First Year	
First Semester	
ENGE 1024: Engineering Exploration	2
CHEM 1035: General Chem	3
CHEM 1045: General Chem Lab	1
ENGL 1105: Freshman English	3
MATH 1114: Linear Algebra	2
MATH 1205: Calculus I	3
Curriculum for Liberal Education (Recommended Area 6)	1
Credits	**15**
Second Semester	
ENGE 1104: Eng Digital Future	2
ECE 1574: Engineering Problem Solving with C++	3
ENGL 1106: Freshman English	3
MATH 1224: Vector Geometry	2
MATH 1206: Calculus II	3
PHYS 2305: Found Physics with Lab	4
Credits	**17**
Second Year	
First Semester	
ECE 2014: Engineering Professionalism[2]	2
ECE 2504: Intro to Computer Engineering	3
ECE 2574: Intro to Data Structures and Software Engineering	3
MATH 2214: Differential Equations	3
PHYS 2306: Foundations of Physics II/Lab	4
Curriculum for Liberal Education (Recommended Area 2)	3
Credits	**18**
Second Semester	
ECE 3534: Microprocessor System Design	4
ECE 2524: Introduction to UNIX	2
ECE 2004: Circuit Analysis	3
ECE 2074: Electric Circuit Analysis Lab	1
MATH 2224: Multivariable Calculus	3
MATH 2534: Discrete Math	3
Credits	**16**

Third Year	
First Semester	
ECE 3574: Software Engineering	3
ECE 2204: Electronics I	3
ECE 2274: Electronics Networks Lab I	1
ECE 2704: Signals and Systems	3
ECE 3504: Digital Design	4
Curriculum for Liberal Education (Recommended Area 2)	3
Credits	**17**
Second Semester	
CPE Technical Elective[1]	3
CPE Technical Elective[1]	3
ECE 2500: Computer Organization & Architecture	3
ISE 2014: Engineering Economy	2
STAT 4714: Probability/Statistics for Engineers	3
ENGL 3764: Technical Writing[2]	3
Credits	**17**
Fourth Year	
First Semester	
ECE 4534: Embedded Systems	4
CPE Design Technical Elective[3]	3
CPE Technical Elective[1]	3
Curriculum for Liberal Education (Recommended Area 3)	3
Curriculum for Liberal Education (Recommended Area 7)	3
Credits	**13**
Second Semester	
CPE Design Elective[3]	3
CPE Technical Elective[1]	3
Engineering and Science Elective[4]	3
Curriculum for Liberal Education (Recommended Area 3)	3
Free Elective	3
Credits	**15**

Electrical Engineering Program (EE)

This program applies to students graduating in 2010
Total credits to graduate - 132 (see comments below)

First Year	
First Semester	
ENGE 1024: Engineering Exploration	2
CHEM 1035: General Chem	3
CHEM 1045: General Chem Lab	1
ENGL 1105: Freshman English	3
MATH 1114: Linear Algebra	2
MATH 1205: Calculus I	3
Curriculum for Liberal Education (Recommended Area 6)	1
Credits	**15**
Second Semester	

ENGE 1104: Eng Digital Future	2
ECE 1574: Engineering Problem Solving with C++	3
PHYS 2305: Found Physics with Lab	4
ENGL 1106: Freshman English	3
MATH 1224: Vector Geometry	2
MATH 1206: Calculus II	3
Credits	**17**
Second Year	
First Semester	
ECE 2014: Engineering Professionalism[2]	2
ECE 2004: Network Analysis	3
ECE 2074: Electric Circuit Analysis Lab	1
ECE 2504: Intro to Computer Engineering	3
MATH 2214: Differential Equations	3
PHYS 2306: Foundations of Physics II/Lab	4
Credits	**16**
Second Semester	
ECE 2704: Signals and Systems	3
ECE 2204: Electronics I	3
ECE 2274: Electronics Networks Lab I	1
ECE 2984 or 2534: Microprocessor System Design	4
MATH 2224: Multivariable Calculus	3
Curriculum for Liberal Education (Recommended Area 2)	3
Credits	**17**
Third Year	
First Semester	
ECE 3105: Electromagnetic Fields	3
ECE 3004: AC Circuit Analysis	3
ECE 3004: AC Circuit Analysis Lab	1
ECE 3204: Analog Electronics	3
ECE 3274: Electronics Lab	1
STAT 4714: Probability/Statistics for Engineers	3
ENGL 3764: Technical Writing[2]	3
Credits	**17**
Second Semester	
ECE 3106: Electromagnetic Fields	3
ECE 3304: Introduction to Power Systems	3
ECE 3354: Power Lab	1
ECE 3704: Continuous/Discrete Systems	3
ECE 3614: Introduction to Communication Systems	3
Curriculum for Liberal Education (Recommended Area 3)	3
Credits	**16**
Fourth Year	
First Semester	
EE Technical Elective[7]	3
EE Capstone Elective[6,2]	3
Engineering & Science Elective[4]	3
ISE 2014: Engineering Economics	2

Math Elective[5]	3
Curriculum for Liberal Education (Recommended Area 7)	3
Credits	**17**
Second Semester	
EE Technical Elective[7]	3
EE Technical Elective[7]	3
EE Technical Elective[7]	3
Curriculum for Liberal Education (Recommended Area 3)	3
Curriculum for Liberal Education (Recommended Area 2)	3
Free Elective	2
Credits	**17**

Comments

a. Curriculum for Liberal Education Area 6 one-credit requirement recommended in Engineering Education first year, first semester.
b. Students interested in pursuing professional registration are encouraged to consult with advisors early in their program to permit proper course selection for maximum preparation.
c. A C- or better grade must be attained in core ECE prerequisite courses, including ECE 1574, before proceeding into the next course.

Notes:

[1] Must be selected from department's approved CPE Technical Elective list annually updated.
[2] Curriculum for Liberal Education ViEWS course.
[3] Must be selected from department's approved CPE Design Elective list annually updated.
[4] Must be selected from department's approved Engineering Science list annually updated.
[5] Must be selected from department's approved Math Elective list annually updated.
[6] Must be selected from departments approved EE Capstone Elective list annually updated.
[7] Must be selected from department's approved EE Technical Elective list annually updated.

Undergraduate Course Descriptions (ECE)

1574: OBJECT-ORIENTED ENGINEERING PROBLEM SOLVING WITH C++ Problem solving techniques for engineering problems, primarily from the fields of electrical and computer engineering; procedural and object-oriented program development, editing, compiling, linking, and debugging using the C++ programming language. Must have C- or better in the prerequisites. Pre: ENGE 1024, (MATH 1205 or MATH 1205H).(2H,2L,3C)I,II.

2004: ELECTRIC CIRCUIT ANALYSIS
Introduction to the basic laws and techniques for the analysis of electric circuits. Calculation of the response of circuits with resistors, independent sources, controlled sources, and operational amplifiers. The transient analysis of basic circuits with R, L, and C components. An introduction to AC analysis and phasors. Requires a C- or better in ENGE 1104 or 1204. Pre: ENGE 1104 or ENGE 1204. Co: 2074, MATH 2214. (3H,3C)

2004H: HONORS ELEC CIRCUIT ANALYSIS
Pre: ENGE 1016. Co: MATH 2214. (3H,3C)

2014: ENGINEERING PROFESSIONALISM IN ECE
Overview of the nature and scope of the electrical and computer engineering profession. Working in a diverse team environment; professional and ethical responsibility; the impact of engineering solutions in a global and societal context; contemporary issues; and life-long learning. Sophomore standing required. Pre: 2004 or 2504. (2H,2C)

2074: ELECTRIC CIRCUIT ANALYSIS LABORATORY
Construction, analysis, and characterization of circuits with student-owned Lab-in-a-Box system. Experiments include: characterization of breadboard backplane wiring; component tolerances; Ohm's law; Kirchoff's laws; series and parallel resistors; voltage and current dividers; delta-wye configurations; mesh-current and node- voltage analysis; superposition and Thevenin equivalents; inverting and non-inverting amplifier circuits; series RC and RL circuits; discharging LEDs and integrator and differentiator circuits. Introductory design experiments include a simple voltmeter and a flashing traffic arrow. Must have a C- or better in ENGE 1104 or 1204. Pre: ENGE 1104 or ENGE 1204. Co: 2004, MATH 2214. (3L,1C)

2204: ELECTRONICS
Introduction to basic electronic devices including diodes and transistors and their operating principles. Analysis of electronic circuits operating under dc bias and switching conditions. Applications of devices in digital electronic circuits. Pre: 2004. Co: 2274. (3H,3C)

2204H: HONORS ELECTRONICS
Pre: 2004. Co: 2274. (3H,3C)

2274: ELECTRONIC NETWORKS LABORATORY I Principles of operation of electrical and electronic test equipment and applications to measurement of circuit parameters. Transient and steady state response of RLC networks. Applications of laws and theories of circuits. Design, prototyping, and testing of electronic devices and circuits. Pre: 2074. Co: 2204. (3L,1C) I,II,IV.

2500: COMPUTER ORGANIZATION AND ARCHITECTURE
Computer organization and architecture: instruction formats and construction; addressing modes; memory hierarchy (cache, main memory and secondary memory) operation and performance; simple pipelines; basic performance analysis; simple OS functions, particularly as they relate to hardware; virtual memory; computer I/O concepts, including interrupt and DMA mechanisms; intercomputer communication concepts. Must have C- or better in prerequisite 2504. Pre: 2504. (3H,3C)

2504: INTRODUCTION TO COMPUTER ENGINEERING
An introduction to the design and operation of digital computers, including information representation, logic design, integrated circuits, register transfer description, basic computer organization and machine-level programming. The relationship between software and hardware is stressed. Pre: 1574. (3H,3C)

2524: INTRODUCTION TO UNIX FOR ENGINEERS
Fundamental concepts of operating systems, emphasizing a hands-on introduction to UNIX. User interfaces, UNIX shell commands, the UNIX file system, task management, common system utilities, the UNIX programming environment. Students gain experience with system installation and administration. Duplicates CS 2204. Must have C- or better in prerequisite 2574. Pre: 2574. (2H,2C)

2534: MICROPROCESSOR SYSTEM DESIGN
Operation and application of microprocessors and microcontrollers, including system level organization, analysis of specific processors, and software and hardware interface design. Students may not receive credit for both 2534 and 3534. Pre: 2504. (3H,3L,4C)

2574 (CS 2574): INTRODUCTION TO DATA STRUCTURES AND SOFTWARE ENGINEERING
Introduces a disciplined approach to problem-solving and emphasizes the utility of software engineering principles applied to programming practices. Also stressed are program design and implementation involving multiple modules, verification of program correctness, and abstract data types and objects such as strings, arrays, sets, linked lists, stacks, queues, and files. Pre: 1574 - A grade C- or better. Pre: 1574. (3H,3C)

2704: SIGNALS AND SYSTEMS
Analysis techniques for signals and systems. Signal representation, including Fourier and LaPlace transforms. System definitions and properties, such as linearity, causality, time invariance, and stability. Use of convolution, transfer functions and frequency response to determine system response. Applications to circuit analysis. Pre: (2004 or 2004H), (MATH 2214 or MATH 2214H). (3H,3C) I,II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
A minimum GPA of 2.0 in all ECE courses is required for enrollment. Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: AC CIRCUIT ANALYSIS
Application of the basic laws and techniques of circuit analysis to AC circuits. Complex numbers and algebra with an emphasis on phasor representation of circuits. Calculation of the frequency response of circuits with R, L, and C components, independent sources, controlled sources, and operational amplifiers. Analysis of AC steady-state circuits and determination of average power. Magnetically coupled circuits. Laplace and Fourier transforms. Representation of circuits by two-port models. Pre: 2704. Co: 3074. (3H,3C)

3054: ELECTRICAL THEORY
For students in curricula other than ECE. Fundamentals of electric circuits: circuit laws and network theorems, operational amplifiers, energy storage elements, response of first and second order systems. AC steady state analysis. Pre: PHYS 2306. Co: MATH 2214. (3H,3C)

3074: AC CIRCUIT ANALYSIS LABORATORY
Construction, analysis, and characterization of circuits with student-owned Lab-in-a-Box system. Experiments include: sinusoids and phasors including impedance, admittance, and Kirchhoff's laws; sinusoidal steady- state including node and mesh analysis, Thevenin and Norton equivalent, and op amps; ac power analysis including instantaneous and average power, power factor, and complex power; magnetically coupled circuits including mutual inductance, energy in a coupled circuit, and transformers; frequency response including transfer functions, Bode plots, resonance, and passive and active filters; and two-port circuits. A C- or better is required for all prerequisites. Pre: 2074. Co: 3004. (3L,1C)

3105-3106: ELECTROMAGNETIC FIELDS
Maxwell's equations and their application to engineering problems. 3105: transmission lines, electrostatics, magnetostatics. 3106: time-varying fields, Maxwell's Equations, waves, propagation, guided waves, radiation. Pre: PHYS 2306, MATH 2224, (ECE 2004 or ECE 2004H) for 3105; 3105 for 3106. (3H,3C)

3204: ANALOG ELECTRONICS
Small signal modeling of transistors. Basic architecture and functionality of linear amplifiers including transistor biasing circuits, current sources, differential amplifier, common emitter amplifier, common source amplifier,emitter follower, and source follower. Operational amplifier operating principles, circuit design, and applications. Frequency response of single stage and multistage amplifiers. Feedback systems and stability analysis of amplifiers. Pre: 2204, 2704. Co: 3274. (3H,3C)

3254: INDUSTRIAL ELECTRONICS

For students in curricula other than EE and CpE. Fundamentals of electronics, including basic device principles. Circuit applications include digital, op-amp, and analog analysis for industrial applications. Pre: 3054. (2H,3L,3C) I,II,IV.

3274: ELECTRONIC CIRCUITS LABORATORY II
Design, build, and test amplifiers and other electronic circuits to meet specifications. Bipolar and field-effect transistors, diodes, integrated circuits such as operational amplifiers, and passive components are used. Gain, bandwidth, input and output impedance, positive and negative feedback, and circuit stability are implemented in the designs. Digital oscilloscopes, ammeters, voltmeters, function generators, and power supplies are used. A grade of C- or better is required in all pre-requisite courses. Pre: 2274, 3074. Co: 3204. (3L,1C)

3304: INTRODUCTION TO POWER SYSTEMS
Basic concepts of AC systems, single-phase and three-phase networks, electric power generation, transformers, transmission lines, electric machinery and the use of power. Pre-requisite 3004 with C- or better. Pre: 3004. (3H,3C)

3354: ELECTRIC POWER ENGINEERING LABORATORY
Laboratory experiments based on principles of electric power engineering. Co: 3304. (3L,1C) II.

3504: DIGITAL DESIGN I
Design techniques for combinational and sequential logic. Design of digital circuits using standard integrated circuit chips and programmable logic devices. Computer simulation will be used to validate designs. Prototypes will be constructed to demonstrate design functionality. Pre: 2504. (3H,3L,4C) I,II.

3534: MICROPROCESSOR SYSTEM DESIGN
Operation and applications of microprocessors and microcontrollers, including system level organization, analysis of specific processors, and software and hardware interface design. Pre: 2504. (3H,3L,4C)

3574: APPLIED SOFTWARE ENGINEERING
Software engineering models, tools and techniques are applied to the development of large scale engineering software projects. Pre: 2574. (3H,3C)

3614: INTRODUCTION TO COMMUNICATION SYSTEMS
Analysis and design of analog and digital communication systems based on Fourier analysis. Topics include linear systems and filtering, power and energy spectral density, basic analog modulation techniques, quantization of analog signals, line coding, pulse shaping, and transmitter and receiver design concepts. Applications include AM and FM radio, television, digital communications, and frequency-division and time-division multiplexing. Pre: 2704. (3H,3C)

3704: CONTINUOUS AND DISCRETE SYSTEM THEORY
Continuous- and discrete-time system theory. Block diagrams, feedback, and stability theory. System analysis with Bode diagrams. Discrete-time stability, difference equations, Z-transforms, transfer functions, Fourier transforms, and frequency response. Sampling of continuous systems and an introduction to digital filtering. Pre: 2704. (3H,3C) I,II.

3964: FIELD STUDY
Variable credit course.

3974: INDEPENDENT STUDY
Variable credit course.

3984: SPECIAL STUDY
Variable credit course.

4104: MICROWAVE AND RF ENGINEERING
Passive and active Radio Frequency and microwave components and circuits for wireless communications; transmission-line theory; planar transmission-lines and waveguides; S-parameters; resonators; power dividers and couplers; microwave filters; sources, detectors, and active devices; modern RF & microwave CAD; measurement techniques. Pre: (3106, 3204). (3H,3L,4C)

4114: ANTENNAS
Antenna fundamentals, analysis and design principles, and a survey of antenna types including: arrays, wire antennas, broadband antennas, and aperture antennas. Pre: 3106. (3H,3C) II.

4124: RADIO WAVE PROPAGATION
Behavior of radiated electromagnetic waves in terrestrial, atmosphere, space, and urban environments; path, frequency and antenna selection for practical communication systems; propagation prediction. Pre: 3106. (3H,3C)

4134: FIBER OPTICS APPLICATIONS
Theory of optical fiber waveguide propagation and design applications in communication and sensing systems. I Pre: 3106. (3H,3C)

4144: INTRODUCTION TO OPTICAL INFORMATION PROCESSING
Modern wave optics. The application of Fourier transforms to image analysis, optical spatial filtering, and image processing. Pre: 3106. (3H,3C) II.

4154: INTRODUCTION TO SPACE WEATHER
The space environment from the Sun to the Earth's upper atmosphere and the practical consequences (space weather) of this environment on the modern technologies and human health. Concepts in space plasma physics. Examples of observations and data utilized to illustrate the environment and its dynamic variability. Pre: 3106. (3H,3C)

4164: INTRODUCTION TO GLOBAL POSITIONING SYSTEM (GPS) THEORY AND DESIGN
Fundamental theory and applications of radio navigation with the Global Positioning System GPS. Satellite orbit theory, GPS signal structure and theory, point positioning with pseudoranges and carrier phases, selective availability, dilution of precision, differential GPS, atmospheric effects on GPS signals. Pre: 3106 or AOE 4134. (3H,3L,4C)

4205-4206: ELECTRONIC CIRCUIT DESIGN
Stability and response of feedback amplifier, wideband amplifiers, operational amplifier characteristics, waveform generators and wave shaping, nonlinear circuit applications, signal generators, and photolithography. Design of analog electronic circuits, circuit simulation, response characterization, and printed circuit construction. Pre: 3204 for 4205; 4205 for 4206. (3H,3C) I,II.

4214: SEMICONDUCTOR DEVICE FUNDAMENTALS
Fundamental semiconductor device physics associated with semiconductor materials and devices with an in-depth coverage of p-n and Schottky diodes, bipolar junction transistors and metal-oxide semiconductor and junction field effect transistors. Pre: 2204 or MSE 3204 or PHYS 3455. (3H,3C)

4220: ANALOG INTEGRATED CIRCUIT DESIGN
Integrated circuit design in silicon bipolar, MOS, and BiCMOS technologies for communications, sensor, instrumentation, data conversion, and power management applications. Models for integrated circuit active devices in bipolar and MOS technologies; noise; current mirrors, active loads and references; amplifiers and output stages; operational amplifiers; and an introduction to data conversion circuits. Circuit design at the IC level; modern VLSI CAD software. A grade of C- or better required in pre-requisite 3204. Pre: 3204 or 3204. (3H,3C)

4224: POWER ELECTRONICS
Power devices and switching circuits including inverters and converters; electronic power processing and control as applied to industrial drives, transportation systems, computers, and spacecraft systems. I Pre: 3204. (3H,3C)

4234 (MSE 4234): SEMICONDUCTOR PROCESSING
Manufacturing practices used in silicon integrated circuit fabrication and the underlying scientific basis for these process technologies. Physical models are developed to explain basic fabrication steps, such as substrate growth, thermal oxidation, dopant diffusion, ion implantation, thin film deposition, etching, and lithography. The overall CMOS integrated circuit process flow is described within the context of these physical models. I. Pre: 2204 or 3054. (3H,3C)

4235-4236 (MSE 4235-4236): PRINCIPLES OF ELECTRONIC PACKAGING
This two-course sequence covers principles and analyses for design and manufacture of electronic packages. 4235: design issues such as electrical, electromagnetic, thermal, mechanical, and thermomechanical, are covered at the lower levels of packaging hierarchy. Materials and process selection guidelines are discussed for the manufacturing and reliability of chip carriers, multichip and hybrid modules. 4236: system-level package design issues for meeting application requirements and modeling tools for analyzing electronic packages are introduced. Materials and process selection guidelines are discussed for the manufacturing and reliability of packaged electronic products. Pre: 2204, 3054 for 4235; 2204, (4235 or MSE 4236) for 4236. Co: 3054 for 4235. (3H,3C)

4244: INTERMEDIATE SEMICONDUCTOR PROCESSING LABORATORY
Design, layout, fabricate, and characterize microelectronic devices. Analyze test results to verify performance to the predetermined specifications. Required oral and written reports. A C- or higher is required in all pre-requisite courses. Pre: 4234 or MSE 4234. (1H,6L,3C)

4284: POWER ELECTRONICS LABORATORY
Design and testing of electronic power processing systems for commercial and aerospace applications. Pre: 4224. (3L,1C) II.

4304: DESIGN IN POWER ENGINEERING
A study of the principles in electric power engineering. Expert systems, superconductivity, DC transmission, motor control, system protection, high performance motors, solar energy, microcomputer applications, machine design, computer-aided design, digital relaying and space station application. I (3H,3C)

4314: CONTROL AND APPLICATIONS OF ELECTRIC MACHINES
Dynamics and control of different applications of electric machines, DC machines, synchronous machines, polyphase induction machines, and fractional horsepower machines. I Pre: 3304. (3H,3C)

4324: ELECTRONIC CONTROL OF MACHINES
Dynamics and control of electric machines driven by electronic power converters. Pre: 4405, 4224. (3H,3C) II.

4334: POWER SYSTEM ANALYSIS AND CONTROL
Development of methods for power analysis and control. An analysis and design of systems for steady state, transient, and dynamic conditions. Digital solutions emphasized. I Pre: 3304. (3H,3C)

4344: ELECTRIC POWER QUALITY FOR THE DIGITAL ECONOMY
Causes, consequences and solutions of power quality problems that affect the operation of computerized processes and electronic systems. Industry standards, monitoring techniques and economic consideration of power quality issues. Pre: 3304. (3H,3C)

4354: POWER SYSTEM PROTECTION
Protection of power apparatus and systems. Fuses. Voltage and current transducers. Relays. Coordination of relays. Pilot channels. Grounding practices. Surge phenomena. Insulation coordination. Pre: 4334. (3H,3C) II.

4364: ALTERNATE ENERGY SYSTEMS

Electric energy from alternative energy sources including solar, wind, hydro, biomass, geothermal and ocean. Characteristics of direct conversion, electromechanical conversion, and storage devices used in alternative energy systems. Power system issues associated with integration of small scale energy sources into the electricity grid. Pre: STAT 4714. (3H,3C) II.

4374: POWER SYSTEM PROTECTION LABORATORY
Experimental verification of principles and practice of protective relaying. Experiments and design projects to demonstrate the principles and techniques of industrial power system design. Fuses, time overcurrent, and instantaneous relays. Differential relaying for transformers. Distance relaying. Current and voltage transformers. Pre: 4334. Co: 4354. (3L,1C) II.

4405-4406: CONTROL SYSTEMS
4405: Introduction to the design of feedback compensation to improve the transient and steady-state performance of systems. Course covers modeling techniques, root locus analysis and design, Nyquist criterion, and frequency domain compensation. Must have a C- or better in prerequisite 3704. 4406: Extension of the techniques of 4405 to systems controlled by digital compensators. Course covers discrete-time modeling of continuous-time systems, discrete-time redesign of continuous controllers, root-locus compensation, and frequency domain compensation. A capstone design project involving both written and oral presentations is required. Must have a C- or better in prerequisite 4405. Pre: 3704 for 4405; 4405 for 4406. (3H,3C)

4415-4416: CONTROL SYSTEMS LABORATORY
Design and implementation of controllers for physical systems. System identification techniques. 4415: Supplements material in ECPE 4405. Continuous-time modeling and control. 4416: Supplements material in ECPE 4406. Discrete-time modeling and control. Co: 4405 for 4415; 4406 for 4416. (3L,1C) I,II.

4500: FUNDAMENTALS OF COMPUTER SYSTEMS
Fundamental principles and concepts of computer systems. Computer hardware; Boolean logic; number systems and representation; design and operation of digital logic; instruction set architectures and computer organization; and basics of data communication and networking. Partially duplicates ECE 3504 and 4504. Master of Information Technology students only. Pre: Ability to program in a modern high-level programming language. (3H,3C)

4504 (CS 4504): COMPUTER ORGANIZATION
Information representation and transfer; instructions and data access methods; the control unit and microprogramming; memories; input/output and interrupts; secondary storage; the von Neumann SISD organization; high level language machines; the RISC concept; special purpose processors including operating system, file, text, floating point, communication, etc. Multicomputers; multiprocessors; concurrent processing support; Pipeline machines, processor arrays, database machines; the data flow/data directed approach; computer networks. A grade of C or better required in CS prerequisite 3204. Pre: CS 3204. (3H,3C) I,II.

4514: DIGITAL DESIGN II
In this course, students will learn to use a hardware descriptive language (VHDL) in the digital design process. Emphasis will be on system-level concepts and high-level design representations. Methods will be learned that are appropriate for use in automated synthesis systems. Students will have the opportunity to use commercial schematic capture and simulation tools to design a series of increasingly complex devices. Students will also use a logic synthesis tool and synthesize assignments into Field Programmable Gate Arrays. Must have a C- or better in prerequisite 3504. Pre: 3504. (3H,3L,4C)

4520: DIGITAL AND MIXED-SIGNAL SYSTEM TESTING AND TESTABLE DESIGN
Various topics on testing and testable design for digital and mixed-signal systems are studied: fault modeling, logic and fault simulation, fault modeling, automatic test pattern generation, deterministic ATPG, simulation-based ATPG, delay fault testing, design for testability, built-in-self-test and fault diagnosis. Pre: 3504, 2574. (3H,3C)

4524: ARTIFICIAL INTELLIGENCE AND ENGINEERING APPLICATIONS
Problem solving methods; problem spaces; search techniques; knowledge representation; programming languages for AI; games; predicate logic; knowledge-based systems; machine learning; planning techniques; reactive systems; artificial neural networks; natural language understanding; computer vision; robotics. Pre: 2574, STAT 4714. (3H,3L,4C)

4530: HARDWARE-SOFTWARE CODESIGN
An introduction to the design of mixed hardware- software systems, focusing on common underlying modeling concepts, the design of hardware-software interfaces, and the trade-offs between hardware and software components. Students will use simulation tools to conduct experiments with mixed hardware-software systems in the area of embedded systems. Pre: 3504, (2984 or 2534). (3H,3C)

4534: EMBEDDED SYSTEM DESIGN
Microprocessor development systems, programming using assembly and higher-level languages. Implementation of embedded application algorithms. Details of a contemporary microprocessor architecture. Comparative analysis of advanced architecture and specialty architectures. Laboratory work is required. Software development including multiple memory models, device drivers, basic network principles including internet applications. Pre: 3534 or 2534. (3H,3L,4C)

4540: VLSI CIRCUIT DESIGN
Introduction to the design and layout of Very Large Scale Integrated Circuits (VLSI). Emphasis is placed on digital CMOS circuits. Static and dynamic properties of MOSFET devices, along with integrated circuit fabrication are examined. Computer-aided design tools are used to produce working integrated circuit designs. Pre: 2204, 2504. (3H,3C)

4550: REAL-TIME SYSTEMS
Introduction to real-time systems, real-time scheduling including multiprocessor scheduling, real-time operating systems (kernels), real-time communication, real-time programming languages, reliability and fault-tolerance, and real-time system requirements and design methods. Design,

analysis, and implementation of real-time kernel mechanisms and real-time applications using kernels such as Linux and programming languages such as C (with POSIX primitives) and Ada 95. Must have a grade of C- or better in prerequisites 4534 or CS 3204. Pre: 4534 or CS 3204. (3H,3C) II.

4560: COMPUTER AND NETWORK SECURITY FUNDAMENTALS
This course introduces fundamental security principles and real-world applications of Internet and computer security. Topics covered in the course include legal and privacy issues, risk analysis, attack and intrusion detection concepts, system log analysis, intrusion detection and packet filtering techniques, computer security models, computer forensics, and distributed denial-of-service (DDoS) attacks. Must have C- or better in ECE 4564 or CS 4254. Pre: 4564 or CS 4254. (3H,3C)

4564: NETWORK APPLICATION DESIGN
Application program interface and network transport services including User Datagram Protocol and Transmission Control Protocol from the Internet Protocol suite. Client-server organization and design of synchronous, asynchronous, and multithreaded client and server applications. Design, implementation, and testing techniques to improve robustness and performance. Partially duplicates CS 4254 and credit will not be allowed for both. Pre: (2504 or 2574). (3H,3C)

4570 (CS 4570): WIRELESS NETWORKS AND MOBILE SYSTEMS
Multidisciplinary, project-oriented design course that considers aspects of wireless and mobile systems including wireless networks and link protocols, mobile networking including support for the Internet Protocol suite, mobile middleware, and mobile applications. Students complete multiple experiments and design projects. Pre: 4564. (3H,3C)

4574: LARGE-SCALE SOFTWARE DEVELOPMENT FOR ENGINEERING SYSTEMS
Large-scale software implementations of the hierarchy of engineering analysis, design, and decision evaluation. Computer-aided engineering programs with state-of-the-art computer tools and methods. Operator overloading, dynamic polymorphism, graphical user interfaces, generic programming, dynamic link libraries, and multiple threads. Pre: 3574. (3H,3C)

4605-4606: RADIO ENGINEERING
Wireless application circuit design for gain and filter control at radio frequencies to interface the baseband processing systems and the antennas of communication systems. 4605: Design of radio transmitter and receiver circuits using scattering-parameter methods. Circuits include oscillators, radio frequency amplifiers and matching networks, mixers and detectors. 4606: Design of amplitude, frequency, and pulse-modulated communication systems, including modulators, detectors, and the effects of noise. Design basics and guidelines for phaselocked loops and several power amplifier configurations. Pre: 3106, 3204, 3614 for 4605; 4605 for 4606. Co: 4675 for 4605. (3H,3C) I,II.

4614: TELECOMMUNICATION NETWORKS
An introduction and overview of the architecture, technology, operation, and application of telecommunication networks. Major topics include the convergence of telephone and computer networks, the layered architecture of computer networks with emphasis on the Internet, and wireless network technology and applications. Pre: 2504, 2704, STAT 4714. (3H,3C)

4624: DIGITAL SIGNAL PROCESSING AND FILTER DESIGN
Analysis, design, and realization of digital filters. Discrete Fourier Transform algorithms, digital filter design procedures, coefficient quantization. Pre: C or better in 3704 Pre: 3704. (3H,3C)

4634: DIGITAL COMMUNICATIONS
System level analysis and design for digital communications systems: analog-to-digital conversion, digital baseband communications, carrier modulation formats, matched filters, bandwidth efficiency, receiver design, link budgets, signal-to-noise ratio, bit error rates in additive- white-noise Gaussian (AWGN) channels, and multiple access. Must have a grade of C- or better in prerequisites 3614 and STAT 4714. Pre: 3614, STAT 4714. (3H,3C)

4644: SATELLITE COMMUNICATIONS
Theory and practice of satellite communications. Orbits and launchers, spacecraft, link budgets, modulation, coding, multiple access techniques, propagation effects, and earth terminals. Pre: 3614. (3H,3C) II.

4654: DSP IMPLEMENTATION OF COMMUNICATION SYSTEMS
An introduction to designing communication subsystems and involves designing and implementing in software demodulators, signal synthesizers, and synchronizers. A significant part of this class will be DSP programming. Pre: 4624, 4634. (3H,3C)

4664: ANALOG & DIGITAL COMMUNICATIONS LABORATORY
Laboratory experiments which deal with the design and measurement of analog and digital communication systems. Concepts include SNR, Modulation Index, PCM, and spread spectrum. I Pre: 3614. Co: 4634. (3L,1C)

4674: SCATTERING PARAMETERS LABORATORY
Laboratory techniques for ultra-high frequency measurements. Emphasizes the design of a microstrip amplifier using scattering parameter measurement and analysis. Pre: 4605, 4675. (3L,1C) II.

4675-4676: RADIO ENGINEERING LABORATORY
Laboratory techniques for radio frequencies including the design of amplifiers, oscillators, and a single-side-band receiver. Associated measurements will be used. Pre: 3106, 3204 for 4675; 4675 for 4676. Co: 4605 for 4675; 4606 for 4676. (3L,1C) I,II.

4704: PRINCIPLES OF ROBOTICS SYSTEMS
Introduction to the design, analysis, control, and operation of robotic mechanisms. Introduction to the use of homogeneous coordinates for kinematics, dynamics, and camera orientation; sensors and actuators, control, task planning, vision, and intelligence. Pre: 3704. (3H,3C) II.

4734 (ME 4734): MECHATRONICS

Electromechanical system modeling, control and applications. Design of electronic interfaces and controllers for mechanical devices. Sensor technology, signal acquisition, filtering, and conditioning. Microcontroller-based closed-loop control and device communications. Sensor and actuator selection, installation, and application strategies. I Pre: 2504, 2704 or ME 3514. (3H,3C)

4904: PROJECT AND REPORT
Investigation and report on a special project under the direction of a faculty advisor. Course may be extended over several semesters with a letter grade assigned at the end of the semester in which the project and report are completed. Involves design, construction, and testing of a circuit or system. A minimum in-major GPA of 2.5 is required for enrollment. Variable credit course.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
A minimum in-major GPA of 2.0 is required for enrollment. Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
A minimum in-major GPA of 2.5 is required for enrollment. Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
A minimum GPA of 2.0 in all ECE courses is required for enrollment. Variable credit course. X-grade allowed.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Engineering Education

www.enge.vt.edu
E-mail: enge@vt.edu

University Exemplary Department

O. Hayden Griffin, Jr., Head
R. M. Goff, Assistant Head
Professors: O.H. Griffin, Jr.; J.P. Terpenny[1]; B.A. Watford
Associate Professors: J.B. Connor; R.M. Goff; M.H. Gregg; T.W. Knott; V.K. Lohani; T.D.L. Walker
Assistant Professors: M.J. Borrego; A. Johri; H.M. Matusovich; L.D. McNair; M.C. Paretti, C.B. Williams[1]
Advanced Instructor: J.L. Lo
Instructor: D.L. Pollio
Career Advisor: D.L. Pollio
[1]Joint appointment with Mechanical Engineering

Overview

The Department of Engineering Education (ENGE) teaches first-year and second-year engineering courses, advises General Engineering (GE) students, and offers graduate programs, including a graduate certificate and a Ph.D., in engineering education. The department offers second-year courses in engineering topics such as computer-aided design and programming.

At the undergraduate level, the department provides the foundation for students to complete a bachelor of science degree in one of the college of engineering programs and move into degree-related employment or graduate studies. At the graduate level, the department prepares students to teach engineering and conduct research related to teaching, learning, and assessment in engineering contexts.

Accreditation statements may be found in the listings for individual undergraduate degree programs.

The National Science Foundation (NSF) Center for e-Design is a major asset to Engineering Education. The mission of this multi-university industry/university center is to serve as a national center of excellence in IT-enabled design and realization of products and systems. The main objectives are twofold: 1) to research, develop, and test methods and technologies for collaborative design environments that enable lower cost, higher quality, faster to market products, and 2) to nurture and cultivate a new breed of engineers, scientists, and business leaders in this new design paradigm through an educational model that includes close collaborations with industry and use of the latest technologies and methods. Refer to the Center web site for more information: http://www.e-designcenter.info/.

Faculty from the department have created and direct the Virginia Tech Engineering Communications Center (VTECC), a research center focused on understanding engineering communication and collaboration practices in industry and academic settings. As part of its outreach mission, VTECC continually uses the findings from industry and classroom research sites to help engineering faculty and departments develop assignments and curricula that effectively address professional skills such as written and oral communication and multidisciplinary collaboration (http://www.eng.vt.edu/vtecc).

Our department is also the organizational home of the Joseph F. Ware, Jr. Advanced Engineering Laboratory. The Ware Lab, as it is commonly known, is a College of Engineering facility that is home to many of the hardware realization projects in the College (http://www.eng.vt.edu/warelab/).

Special Facilities

The department has a student project laboratory, the Frith Freshman Engineering Design Laboratory, equipped for hands on engineering design and reverse engineering activities. The Frith Lab is reconfigurable for a number of different activities and has been used for purposes ranging from simple mechanical fabrication to using small fuel cells for experimental purposes.

First Year Students and General Engineering

The General Engineering (GE) program of the EngE department serves first-year students in the College of Engineering. Through EngE courses, these first-year students, often with little firsthand knowledge of engineering, participate in basic problem solving and design exercises that represent the essence of the engineering profession. The courses emphasize team-based design-oriented hands-on experience to develop students' concepts of engineering and engineering methods while reinforcing the role of concurrent required courses (e.g. mathematics, chemistry, English, physics), as well as serving as a foundation for subsequent courses in the various engineering curricula. Coverage of engineering ethics instills a sense of the responsibilities of engineers to society. Algorithm development and computer programming develop logical thinking, provide the background for computer use in later courses, and complement problem solving skills. Spatial visualization skills are developed through engineering graphics, a primary engineering tool. Through writing and presentations students begin to develop professional communication skills, including audience analysis, visual rhetoric, effective writing styles, opportunities and problems posed by electronic writing environments, issues in collaborative writing, techniques of oral presentation, print and Web-based research, graphics for written and oral presentations, and editing.

All College of Engineering students must own 1) a convertible tablet PC computer meeting current specifications, and 2) stipulated software used to analyze and solve problems in and out of class.

Transfer to Engineering Departments

Entering students are admitted to General Engineering, the first-year program for all engineering curricula. As noted, this program introduces students to foundational concepts and practices in engineering, allows time to adjust to the College, and provides opportunities to investigate the College's individual degree programs and select the branch of engineering (or computer science) best suited to their skills and interests. At the end of the year – after additional advising, counseling, contacts with the various departments, and satisfactory progress – students select a degree program and, if academically eligible, are transferred to the appropriate degree-granting department. Students achieving Dean's List status (GPA of 3.4 or higher) at the end of their first semester can transfer to their selected department in the beginning of their second semester. Students must earn a minimum grade of C- in the first EngE course, ENGE 1024, in order to be eligible to take all subsequent ENGE courses. Also, a minimum grade of C- in all other first-year ENGE courses is required before transferring to a degree-granting department.

In addition to requiring successful completion of the first-year courses, some degree-granting programs have additional restrictions and/or required courses before students may transfer from General Engineering. Please see the previous catalog section, titled "Required Academic Progress," for details.

First Year	
First Semester	
CHEM 1035: General Chemistry	(3)
CHEM 1045: General Chemistry Lab	(1)
ENGE 1024: Engineering Exploration	(2)
ENGL 1105: Freshman English	(3)
MATH 1205: Calculus I	(3)
MATH 1114: Linear Algebra	(2)
Liberal Education or other Elective	(1-3)
Credits	**(15-17)**

Second Semester (Total recommended course load is 15-18 credits. Students interested in degree programs requiring only 14 credits should consider selecting a course from Area 2 or Area 3 of the Curriculum for Liberal Education.	
ENGL 1106: Freshman English	(3)
MATH 1206: Calculus II	(3)
MATH 1224: Vector Geometry	(2)
PHYS 2305: Foundations of Physics I (includes laboratory)	(4)
Students interested in Biological Systems Engineering: CHEM 1036: General Chemistry	
Students interested in Computer Science, Computer Engineering, or Electrical Engineering: ENGE 1104: Exploration of the Digital Future	(2)
Students interested in Computer Engineering or Electrical Engineering: ECE 1574: Programming and Problem Solving for EEs and CPEs	(3)
Students interested in Computer Science: CS 1705: Intro to Object-Oriented Development or CS 1124: Intro to Media Computation	(3)
Students interested in Aerospace Engineering, Biological Systems Engineering, Chemical Engineering, Civil & Environmental Engineering, Construction Engineering & Management, Engineering Science & Mechanics, Industrial & Systems Engineering, Materials Science & Engineering, Mechanical Engineering, Mining & Minerals Engineering, and Ocean Engineering:	
ENGE 1114: Exploration of Engineering Design	(2)
Students interested in Chemical Engineering:	
CHEM 1036 & 1046: General Chemistry & Laboratory	(3&1)

Graduate Courses

The department's growing graduate program provides opportunities for students pursuing advanced degrees in engineering (or related areas) to expand their knowledge of teaching and learning in engineering contexts. Courses help prepare students for academic careers in engineering, understand the principles that guide teaching methods in various types of engineering courses, and develop tools for assessing both student learning and program effectiveness. In addition, the department provides opportunities for students to participate in research projects that advance our understanding of engineering pedagogy. A Graduate Certificate in Engineering Education is available for graduate students from any Virginia Tech department. The Ph.D. in Engineering Education is designed for graduate students who desire to perform and lead rigorous research in the field of engineering education.

Undergraduate Course Descriptions (ENGE)

1004: TECHNOLOGY AND THE QUALITY OF LIFE
An introduction to the role of technology in enhancing the quality of living. Significant developments during the 19th century are followed by a review of the engineering achievements of the 20th century as defined and described by the National Academy of Engineering. (1H,1C)

1024: ENGINEERING EXPLORATION
Introduction to the profession and the College of Engineering. Foundation material in: problem definition, solution and presentation; design, including hands-on realization working in teams; modeling and visual representation of abstract and physical objects; scientific computation; algorithm development, computer implementation and application; documentation; ethics; and professionalism. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Co: MATH 1205. (2H,2C)

1044: GREEN ENGINEERING LECTURE SERIES
Weekly discussions presented by engineers, environmentalists, scientists, and public officials concerning the need for engineering works to be planned,constructed, and operated in harmony with the environment. (1H,1C)

1104: EXPLORATION OF THE DIGITAL FUTURE
Builds on the principles and practice of engineering design introduced in 1024 and introduces various discipline-specific engineering tools. Topics covered include: the engineering design cycle; patent application and search; basic project management; written and oral communications. Basic computer organization and Boolean algebra. Signal and information coding and representation. Introduction to networking. For students planning to major in Computer Engineering, Computer Science, or Electrical Engineering. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Partially duplicates 1114. Duplicates 1204. Prerequisite requires grade of C- or better. Pre: 1024. (2H,2C)

1114: EXPLORATION OF ENGINEERING DESIGN
Builds on principles and practice of engineering design introduced in 1024 and introduces various discipline-specific engineering tools. Topics covered include: engineering design cycle; patent application and search; basic project management; written and oral communications; computer assisted design and analysis; the graphics language; working in a team environment. Requires successful completion of a team-based design project. For students planning to major in Aerospace Engineering, Biological Systems Engineering, Chemical Engineering, Civil and Environmental Engineering, Engineering Science and Mechanics, Industrial and Systems Engineering, Materials Science and Engineering, Mechanical Engineering, Mining and Minerals Engineering, and Ocean Engineering. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Partially duplicates 1104. Duplicates 1214. Prerequisite requires grade of C- or better. Pre: 1024. (2H,2C)

1204: DIGITAL FUTURE TRANSITION
Builds on the principles and practice of engineering design introduced in 1024 and introduces various discipline-specific engineering tools. Basic computer organization and Boolean algebra. Signal and information coding and representation. Introduction to networking. For students who have successfully completed 1114 and are now planning to major in Computer Engineering, Computer Science, or Electrical Engineering. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Partially duplicates 1104. Prerequisite requires a grade of C- or better. Pre: 1114. (1H,1C)

1214: ENGINEERING DESIGN TRANSITION
Builds on the principles and practice of engineering design introduced in 1024 and introduces various discipline-specific engineering tools. Topics covered include computer assisted design and analysis and the graphics language. For students who have successfully completed 1104 and are currently planning to major in Aerospace Engineering, Biological Systems Engineering, Chemical Engineering, Civil and Environmental Engineering, Engineering Science and Mechanics, Industrial and Systems Engineering, Materials Science and Engineering, Mechanical Engineering, Mining and Minerals Engineering, and Ocean Engineering. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Partially duplicates 1114. Prerequisite requires grade of C- or better. Pre: 1104. (1H,1C)

1224: INTRODUCTION TO ENGINEERING ETHICS
Introduction to the application of basic ethical theories to ethical dilemmas in engineering. Topics include risk and design, professional responsibility, loyalty, conflict of interest, safety, and intellectual property concerns with an emphasis on real-world engineering case studies. Grade of C- or better required of all students attempting entry into College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Partially duplicates 1024. (1H,1C)

1234: ENGINEERING HANDS-ON LAB
Introduction to teamwork; introduction to hand tools; dissection and reassembly of various mechanical and electrical devices such as cameras, computers, drills, and engines; examination of engineering principles and design issues; oral presentation using computer software. (2L,1C)

1431: FUNDAMENTALS OF ENGINEERING
Offered only for students who are missing both first year ENGE courses but would be eligible to transfer to a degree- seeking program in Engineering after one semester. Introduction to the profession and the College of Engineering. Foundation material in: problem definition, solution and presentation; design, including hands-on realization working in teams; modeling and visual representation of abstract and physical objects; scientific computation; algorithm development, computer implementation and application; documentation; ethics; and professionalism. Various discipline-specific engineering tools. Topics covered include: the engineering design process; basic project management; written and oral communications; signal and information coding and representation; introduction to networking; computer assisted design and analysis; sketching dimensioning, algorithm development. Requires successful completion of team-based design project. Grade of C- or better required of all students attempting entry into the College of Engineering programs. Attempts to achieve grade of C- or better limited to two attempts, including attempts utilizing the W grade option. Completion of this course counts as an attempt at ENGE 1024, ENGE 1104, and ENGE 1114. Duplicates ENGE 1024, ENGE 1104, ENGE 1114, ENGE 1204 and ENGE 1214. Must have sophomore standing. Advanced standing in English may be used as a substitute in place of the English pre-requisite. Pre: MATH 1205,

MATH 1206, ENGL 1105, CHEM 1035, (CHEM 1045 or PHYS 2305). (5H,5C)

1434: FUNDAMENTALS OF ENGINEERING
Introduction to the profession and the College of Engineering. Foundation material in: problem definition, solution and presentation; design, including hands-on realization working in teams; modeling and visual representation of abstract and physical objects; scientific computation; algorithm development, computer implementation and application; documentation; ethics; and professionalism. Various discipline-specific engineering tools. Requires successful completion of a team-based project. Grade of C- or better is required of all students attempting entry into College of Engineering programs. Duplicates 1024, 1104, 1114, 1204, and 1214. This course counts as an attempt at each of those courses. Attempts to achieve grade of C- or better is limited to two attempts, including attempts utilizing the W grade option. Enrollment restricted to external transfer students. Co: MATH 1205. (5H,5C)

2314: ENGINEERING PROBLEM SOLVING WITH C++
Algorithmic problem solving techniques for engineering problems for various fields; flowcharting, pseudocode, object-oriented program development, editing, compiling, and debugging using the C++ programming language. For Engineering students only. Must have a C- or better in ENGE 1104 and/or ENGE 1114. Pre: (1104 or 1114), MATH 1114, MATH 1206. (1H,2L,2C)

2324: ENGINEERING PROBLEM SOLVING USING FORTRAN
Introduction of basic computing concepts and programming process including algorithm development, flowcharting, program development, editing, compiling, and debugging using Fortran 90. Emphasis will be on the development and execution of program code to solve engineering problems. Must have C- or better in ENGE 1024. Pre: 1024. (1H,1C)

2344: COMPUTER-AIDED DRAFTING
Introduction to computer-aided drafting concepts, primarily in two dimensions. Creation of two-dimensional system views utilizing lines, polygons, polylines, construction lines; creating drawing views principally applied to facilities design and layout. Must have C- or better in ENGE 1114. Pre: 1114. (1H,1C)

2414: ADVANCED ENGINEERING PROBLEM SOLVING WITH C++
Object-oriented problem solving techniques for engineering problems from various fields; object-oriented program development, editing, compiling, and debugging using the C++ programming language. This course builds on ENGE 2314, the introductory C++ course, so that the student has the prerequisite knowledge required to take ECE 2574. Taught in an on-line format only. Students should request the course directly from the Department of Engineering Education. Partially duplicates 1574. For engineering students only. Not open to EE or CPE majors. Must have a C- or better in ENGE 2314. Pass/Fail only. Pre: 2314. (1H,1C)

2514: INTRODUCTION TO ENGINEERING COMPUTATION AND CONTROL WITH LABVIEW
Introduces engineering computation and control using the LabVIEW graphical programming language and the text/ matrix-based (and MATLAB compatible) MathScript programming language. Topics include algorithm development, flowcharts, pseudocode, programming control structures, structured programming, object oriented programming (OOP), data-flow programming, data acquisition, analysis and device control. Partially duplicates ENGE 2314. Pre: 1104 or 1114. (1H,2L,2C)

2714: PREPARING FOR UNDERGRADUATE ENGINEERING RESEARCH
Preparing for undergraduate research, best engineering research practices, effective technical communication. Limited enrollment determined through written application process. Pre: 1114 or 1104. (1H,1C)

2824: CIVIL ENGINEERING DRAWINGS AND CAD
Introduction to use of CAD in civil engineering, construction, and other land development projects. Read typical civil engineering drawings. Create land development plans, cross section and profile drawings, and detail drawings utilizing computer aided design and drafting tools. Create two and three dimensional visualizations of civil engineering, construction, and other land development projects. Partial duplication of ENGE 2344. CEE majors only. Co: CEE 2804, 1114. (1H,1L,1C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
I
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3714: DOCUMENTING UNDERGRADUATE ENGINEERING RESEARCH
Oral and written documentation of undergraduate research experience. A valid engineering undergraduate research experience required. Pre: 2714. (2H,2C)

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY

Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course. X-grade allowed.

TOP

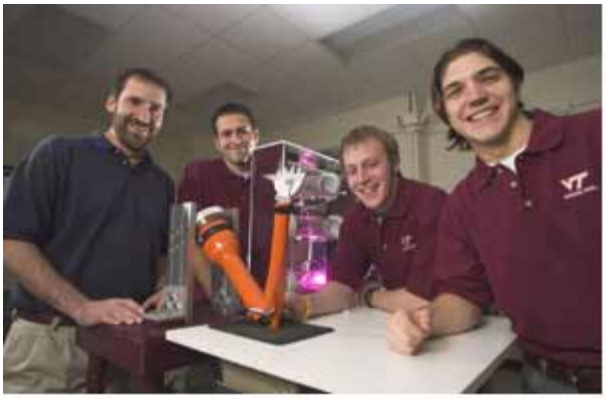
College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Engineering Science and Mechanics

http://www.esm.vt.edu

Ishwar K. Puri, Professor and Head
Scott W. Case, Professor and Associate Head
University Distinguished Professor: A. H. Nayfeh
Reynolds Metals Professor: H. Aref
Clifton C. Garvin Professor: R. C. Batra
Adhesive and Sealant Science Professor: D. A. Dillard
Frank Maher Professor: N. E. Dowling
N. Waldo Harrison Professor: M. W. Hyer
Preston Wade Professor: M. P. Singh
Paul and Dorothea Torgersen Dean's Chair in Engineering Professor: R. Benson
Tucker Professor: R. L. Mahajan
Professors: M. S. Cramer; J. C. Duke; J. W. Grant; M. R. Hajj;
L. G. Kraige; J. J. Lesko; S. A. Ragab
Associate Professors: S. L. Hendricks; R. D. Kriz; M. L. Madigan;
M. A. Stremler; S. Thangjitham
Assistant Professors: R. De Vita; D. M. Dudek; S. Jung; S. D. Ross;
J. J. Socha; A. E. Staples
Adjunct Professors: F. dell'Isola; J. S. Wayne
Professors Emeritus: D. Frederick; R. A. Heller; R. M. Jones; L. Meirovitch; D. H. Morris; D. Post; K.L. Reifsnider; D. J. Schneck;
C. W. Smith; D. P. Telionis; H. W. Tielman



Affiliate Faculty: D. Gao; C. Hall; D. Inman;
R. Kapania; M. Paul; R. Plaut; P. Vlachos; R. Yoon
Career Advisor: S. Griffin
ESM Engineering Communications Program Director: M. C. Paretti

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Overview

Mechanics is a fundamental area of science and engineering. It is an exciting, expanding field of learning with its roots grounded in the laws of motion formulated by Newton and the principles governing the behavior of solids and fluids, branching out in modern times into interdisciplinary fields such as new engineering materials (adhesives, composites, polymers, light metals), biomechanics, transportation, wind engineering, and vehicular structures. Although the problems to which they are applied may change, the basic principles of mechanics remain current and relevant.

The Department of Engineering Science and Mechanics has a rich tradition for providing an interdisciplinary engineering education. We strive to prepare our graduates to succeed in advanced graduate or professional study, industry, and government. In these activities, our alumni will:

- Apply fundamentals of engineering mechanics and related areas of applied science to define, model, and solve a wide range of engineering problems.
- Apply fundamental mathematical and scientific principles, as well as computational and experimental techniques, to the demands of engineering and scientific practice.
- Function on and lead teams that engage in new areas of research and development in engineering, particularly those that cross the boundaries of traditional disciplines.
- Maintain high productivity and high ethical standards.
- Continually enhance their knowledge throughout their careers.
- Communicate effectively to a broad range of audiences.

These educational objectives are supported by a curriculum that provides its graduates with:

- an ability to apply fundamental knowledge of mathematics, science, and engineering
- an ability to design and conduct mechanics experiments
- an ability to analyze and interpret experimental and computational mechanics data
- an ability to design a system, component, or process to meet desired needs by synergistically combining mechanics of materials, fluid mechanics, and dynamics, when necessary
- an ability to effectively function as the leader, or member, of a multi-disciplinary team

- an ability to identify, formulate, and solve engineering problems involving mechanics of materials, fluid mechanics, and/or dynamics
- an understanding of professional and ethical responsibility
- an ability to communicate effectively – orally, graphically, and in writing
- the broad education necessary to understand the impact of engineering solutions on society and the environment
- a recognition of the need for, and an ability to engage in, life-long learning and accomplishment
- a knowledge of contemporary issues (e.g., social, political, technical, economic, etc.)
- a fundamental understanding that will enable the appropriate use and development of the techniques, skills, and modern engineering tools necessary for engineering practice
- a recognition of the importance of safety in phases of engineering design and practice

A total of 12 credit hours of technical electives and 6 credit hours of senior design give the student freedom to develop individually tailored programs of concentrated study. The department has emphasis areas in Biomechanics, Engineering physics, Fluid mechanics, Motions, or Solid mechanics. Exposure to the design process exists throughout the curriculum, culminating in a senior level capstone design course. The department offers official university degree options in Biomechanics and Engineering Physics. The graduation checksheets for all degree options are available at http://www.esm.vt.edu/curriculum_checksheet.php.

The Cooperative Education Program is available to qualified candidates at undergraduate and graduate levels.

Undergraduate courses in engineering science and mechanics are taught on a service basis for all engineering curricula. A **minor** in engineering science & mechanics is available for engineering students. The department offers graduate programs leading to M.S. (thesis and non-thesis option), M.Eng., and Ph.D. The department also participates in the Five Year Bachelor's/Master's Program. Students with an interest in this program should contact the department for additional information.

The Engineering Science and Mechanics program at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 20120-4012 – telephone (410) 347-7700.

Undergraduate Course Descriptions (ESM)

1054: INTRODUCTION TO NDE ENGINEERING
Introduction to science and technology of nondestructive evaluation (NDE) engineering. Basic concepts and terminology are presented. Applications in different industries are explored. (1H,1C) II.

2014: PROFESSIONAL DEVELOPMENT SEMINAR FOR ESM STUDENTS
Topics designed to foster the professional development of the ESM student. ESM program objectives and outcomes. Overview of solid mechanics, fluid mechanics, and dynamics. Synergistic applications in biotechnology, adhesion science, and other applied areas. (1H,1L,1C)

2074 (AOE 2074): COMPUTATIONAL METHODS
Solving engineering problems using numerical methods and software, truncation and round-off error, root finding, linear and polynomial regression, interpolation, splines, numerical integration, numerical differentiation, solution of linear simultaneous equations, numerical solutions of ordinary differential equations. A grade of C- or better required in ENGE prerequisite 1114. Pre: ENGE 1114, (MATH 2224 or MATH 2224H). Co: MATH 2224. (3H,3C)

2104: STATICS
Vector mechanics of forces and moments, free-body diagrams, couples, resultants, equilibrium of particles and rigid bodies in two and three dimensions, forces in trusses, frames, and machines, centroids, centers of mass, distributed forces, internal shear forces and bending moments in beams, shear and moment diagrams, friction, belt friction, area of moments of inertia, parallel axis theorem. Pre: (MATH 1114 or MATH 1114H). Co: MATH 2224. (3H,3C) I,II,III,IV.

2204: MECHANICS OF DEFORMABLE BODIES
Concepts of stress, strain, and deformation. Factor of safety. Stress-strain relationships and material properties. Stress concentrations. Area moments of inertia. Axially loaded members, torsionally loaded members, bending of beams. Shear and moment diagrams. Stresses due to combined loading. Thin-walled pressure vessels. Transformation of stress including Mohr's circle. Beam deflections and buckling stability. Pre: 2104, (MATH 2224 or MATH 2224H). (3H,3C) I,II,III,IV.

2214: STATICS AND MECHANICS OF MATERIALS
Forces, moment, resultants, and equilibrium. Stress, strain, and stress-strain relations. Centroids and distributed loads. Analysis of axially loaded bars and beams. Principal stresses and Mohr's circle, combined loading. Pressure vessels and buckling of columns. Partially duplicates 2104 and 2204. Must be ChE major. I Co: MATH 2224. (3H,3C)

2304: DYNAMICS
Vector treatment of the kinematics and kinetics of particles and rigid bodies, Newton's laws, work and energy, impulse and momentum, impact, mass moments of inertia, rotating axes. Pre: 2104, (MATH 2224 or MATH 2224H). Co: MATH 2214. (3H,3C) I,II,III,IV.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY

Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3015-3016: FLUID MECHANICS I, II
3015: Fluid statics. Dimensional analysis. Control volume approach to flow analysis, pipe flow, boundary layers, compressible flow, open channel flow. 3016: Introduction to continuum mechanics. Fluid kinematics. Differential approach to flow analysis: derivation of mass, momentum and energy equations, vorticity dynamics, potential flows, compressible flows, viscous flows. Pre: 2304, (MATH 2224 or MATH 2224H) for 3015; MATH 4574, ESM 3015 for 3016. Co: ME 3134 for 3015; 3034 for 3016. (3H,3C)

3024: INTRODUCTION TO FLUID MECHANICS
Fluid properties and hydrostatics. Derivation and application of the continuity, momentum, and energy equation (Bernoulli's equation) for ideal and real fluid flow (laminar or turbulent). Dimensional analysis and similtude. Introduction to boundary layers, lift and drag. I Pre: 2304, MATH 2224. (2H,2L,3C)

3034: FLUID MECHANICS LABORATORY
Introduction to experimental fluid mechanics. Technical writing. Experiments on fluid properties, manometry, hydrostatic forces on submerged surfaces, flow measurements, impulse-momentum principle, velocity measurements, drag forces on cylinders, model testing of ships, flow visualization and hydraulic jumps. Demonstration of modern data acquisition. Pre: 3015. (3L,1C) II.

3054 (MSE 3054): MECHANICAL BEHAVIOR OF MATERIALS
Mechanical properties and behavior of engineering materials subjected to static, dynamic, creep and fatigue loads under environments and stress states typical of service conditions; biaxial theories of failure; behavior of cracked bodies; microstructure-property relationships and design methodologies for homogeneous and composite materials. Pre: 2204. (2H,2C) I,II.

3064 (MSE 3064): MECHANICAL BEHAVIOR OF MATERIALS LABORATORY
Laboratory experiments on mechanical properties and behavior of homogenous and composite engineering materials subjected to static, dynamic, creep, and fatigue loads; behavior of cracked bodies; microstructure-property relationships, and
determination of materials properties for use in engineering design. Pre: 2204.
Co: 3054.
(3L,1C)

3114: PROB DEFINITION ENGR DESIGN
Define open-ended engineering design projects, identify relevant broad social, global, economic, cultural and technical needs and constraints, determine ways in which technical skills contribute to addressing complex engineering design challenges. Identify a capstone project for ESM 4015-4016. Pre-requisite: Junior standing in ESM. (2L,1C)

3124: INTERMEDIATE DYNAMICS
Vector analysis, Newton's Laws, rotating coordinate systems, particle dynamics, orbital mechanics, systems of particles, rigid-body dynamics, inertia matrix, Eulerian angles, introduction to gyroscopic motion, Lagrange's equations. Pre: 2304, (MATH 2214 or MATH 2214H), (MATH 2224 or MATH 2224H). (3H,3C) II.

3154: SOLID MECHANICS
Introduction to elasticity and continuum mechanics, plane stress and plane strain; bending of beams, asymmetrical bending, deflections, shear center; torsion of general cross-section bars; comparison of elasticity solutions with strength of materials; introduction to energy methods; elastic stability of columns. Pre: 2204. (3H,3C)

3704: BASIC PRINCIPLES OF STRUCTURES
Static equilibrium of forces and moments, concurrent and nonconcurrent force systems, center of gravity, concentrated and distributed loads. Solution of trusses. Stress and strain, elastic behavior of materials, cables and arches, shear, bending, and deformation in beams, indeterminate structures. Not available to students in engineering. I (3H,3C)

4004: INSTRUMENTATION & EXPERIMENTAL MECHANICS
Introduction to instrumentation. Data analysis: uncertainty, error and statistical concepts. Devices: digital multi-meters, oscilloscopes, power supplies, and function generators. Circuits: ballast circuits, wheatstone bridges, operational amplifiers, and transistors. Principles of data acquisition. Fourier analysis. Measurements of velocity, pressure, strain, displacement, forces and accelerations. Laboratory and design projects. Pre: 2204, 2304, (3015 or 3024), ECE 3054. (2H,2L,3C)

4014: APPLIED FLUID MECHANICS
Analysis of flow over practical configurations, panel methods, Reynolds-averaged Navier-Stokes equations, turbulent boundary layers, flow separation and three-dimensional effects. Unsteady flows, fluid-structure interactions. I Pre: 2074, 3016. (3H,3C)

4015-4016: CREATIVE DESIGN AND PROJECT I, II
Design of engineering systems and projects encompassing the principles and practices of engineering science and of the several engineering fields. Investigation and report on a supervised design project. Senior standing required. Instructor consent. I 4015: (2H,3L,3C) 4016: (1H,6L,3C)

4024: ADVANCED MECHANICAL BEHAVIOR OF MATERIALS
Mechanical behavior of materials, emphasizing solid mechanics aspects and methods for predicting strength and life of engineering components. Plasticity, failure criteria, fracture mechanics, crack growth, strain-based fatigue, and creep. Microstructure-property relationships, and laboratory demonstrations. Pre: 3054. (3H,3C)

4044: MECHANICS OF COMPOSITE MATERIALS
Introduction to the deformation, stress, and strength analysis of continuous-fiber-polymer-matrix laminated composites. Fabrication, micromechanics of stiffness and expansional coefficients, classical lamination theory (CLT). Environmentally induced stresses. Computerized implementation and design. Pre: 2204. (3H,3C) I.

4074: VIBRATION AND CONTROL
Single-degree-of-freedom vibration, two- and n-degree-of-freedom systems, continuous systems, introduction to nonlinear systems, system stability, introduction to the control of dynamic systems. I Pre: 3124, MATH 4564. (3H,3C)

4084 (AOE 4084): ENGINEERING DESIGN OPTIMIZATION
Use of mathematical programming methods for engineering design optimization including linear programming, penalty function methods, and gradient projection methods. Applications to minimum weight design, open-loop optimum control, machine design, and appropriate design problems from other engineering disciplines. Pre: MATH 2224. (3H,3C)

4105-4106: ENGINEERING ANALYSIS OF PHYSIOLOGIC SYSTEMS
Engineering analysis of human physiology. Physiologic systems are treated as engineering systems with emphasis input-output considerations, system interrelationships and engineering analogs. 4105 - Mass and electrolyte transfer, nerves, muscles, renal system. 4106 - cardiovascular mechanics, respiratory system, digestive systems, senses. Pre: 2304, MATH 2214. (3H,3C) 4105: I,II; 4106:

4114: NONLINEAR DYNAMICS AND CHAOS
Motion of systems governed by first-, second-, and third-order differential and difference equations: stability, geometry, phase planes, bifurcations, Poincare' maps, point attractors, limit cycles, strange attractors, fractal dimensions, Lyapunov exponents. Forced oscillations of one-degree-of-freedom systems: jump phenomena, sub- and superharmonic resonances, Hopf bifurcations, period-multiplying bifurcations, chaos. Pre: 2304, (MATH 2214 or MATH 2214H). (3H,3C) II.

4154 (MSE 4154): NONDESTRUCTIVE EVALUATION OF MATERIALS
Concepts and methods of nondestructive evaluation of materials. Discussion of techniques and mathematical bases for methods involving mechanical, optical, thermal, and electromagnetic phenomena; design for inspectability; technique selection criteria; information processing and handling; materials response measurement and modeling; signal analysis. Pre: 3054, (PHYS 2206 or PHYS 2306). (3H,3C)

4204: MUSCULOSKELETAL BIOMECHANICS
Skeletal anatomy and mechanics. Muscle anatomy and mechanics. Theory and application of electromyography. Motion and force measuring equipment and techniques. Inverse dynamics modeling of the human body. Current topics in musculoskeletal biomechanics research. Pre: 2304, (2074 or ME 2004). (3H,3C)

4224: BIODYNAMICS AND CONTROL
Study of human movement dynamics and neuromuscular control of multi-degree-of-freedom systems. Computational simulation of forward-dynamics and state-space linear control of human movement to investigate functional performance and neuromuscular pathology. Pre: 3124, 4204. (3H,3C)

4234: MECHANICS OF BIOLOGICAL MATERIALS AND STRUCTURES
Anatomy and physiology of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue, and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin. Pre: 3054, (2074 or ME 2004). (3H,3C)

4304: HEMODYNAMICS
Study of the human cardiovascular system and blood flow. Anatomy and physiology of the human heart, vascular system, and its organization. Blood physiology and rheology. Non-Newtonian blood flow models. Steady and pulsatile blood flow in rigid and elastic arteries. Pressure waves in elastic arteries. Three-dimensional blood flow in the aortic arch and flow around heart valves. Pre: 3016 or ME 3404. (3H,3C)

4404: FUNDAMENTALS OF PROFESSIONAL ENGINEERING
A refresher of basic principles and problem solving techniques involving twelve subject areas most common to all engineering curricula. The topics include those tested by the National Council of Engineering Examiners on the EIT (Engineer in Training) examination, the first requirement, in all fifty states, toward P.E. (Professional Engineer) licensing. Duplicates material of other engineering courses and impracticable for nonengineers, hence not usable for credit toward any degree. Pre: Junior and senior standing in Engineering or in Building Construction or Graduate students in Engineering. Pass/Fail only. (2H,2C) II.

4444 (AOE 4054) (CEE 4444): STABILITY OF STRUCTURES
Introduction to the methods of static structural stability analysis and their applications. Buckling of columns and frames. Energy method and approximate solutions. Elastic and inelastic behavior. Torsional and lateral buckling. Use of stability as a structural design criterion. Pre: AOE 3024 or CEE 3404. (3H,3C) II.

4524: INTRODUCTION TO WAVE MOTION
Introduction to fundamentals of wave propagation. Topics include wave speed and dispersion relations, group velocity, wavepackets, waveguides, wave reflections, effects of nonuniformity and nonlinearity. General phenomena will be illustrated through use of specific physical applications and well-known model equations. Examples will be drawn from all areas of the physical sciences including solid and fluid dynamics, acoustics, geophysics, and electromagnetic field theory. Pre: MATH 4564. (3H,3C)

4574 (MSE 4574): BIOMATERIALS
Lectures and problems dealing with materials used to mimic/ replace body functions. Topics include basic material types and possible functions, tissue response mechanisms, and considerations for long term usage. Integrated design issues of multicomponent materials design in prosthetic

devices for hard and soft tissues are discussed. Must meet prerequisite or have graduate standing in the College of Veterinary Medicine. Pre: MSE 3054 or ESM 3054. (3H,3C)

4614: INTRODUCTION TO RELIABILITY-BASED ENGINEERING DESIGN
Basic concepts of reliability, useful probability distributions, probabilistic design, safety factors and safety index, system reliability, failure rate, service life calculations. Pre: 2204, 3064. (2H,2C)

4714: SCIENTIFIC VISUAL DATA ANALYSIS AND MULTIMEDIA
Classical and advanced methods of visual data analysis within scientific applications context; emphasis on examples of scientific investigation with visual tools, and new visual methods with computer graphics; visual data analysis of numerical experimental and analytical results including: gradients, function-extraction, chaos, nth-order tensor glyph representations, molecular synthesis. Pre: (MATH 1015, MATH 1016) or (MATH 1205 or MATH 1205H), (MATH 1206 or MATH 1206H). (3H,3C) II.

4734 (AOE 4024): AN INTRODUCTION TO THE FINITE ELEMENT METHOD
The finite element method is introduced as a numerical method of solving the ordinary and partial differential equations arising in fluid flow, heat transfer, and solid and structural mechanics. The classes of problems considered include those described by the second-order and fourth-order ordinary differential equations and second-order partial differential equations. Both theory and applications of the method to problems in various fields of engineering and applied sciences will be studied. Pre: 2074, (MATH 2224 or MATH 2224H). (3H,3C)

4904: PROJECT AND REPORT
Variable credit course. X-grade allowed.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Undergraduate Non Degree Courses

The following courses are applicable to study in several departments and do not carry departmental designations. Several of the undergraduate courses listed below were developed specifically for students in both engineering and non-engineering majors with the objective of broadening the base of knowledge in cross-disciplinary areas with some background within a technology driven focus. Others were created as partof the academic, professional and personal support services provided for engineering students. Most students will use these courses to satisfy free electives in their programs. Engineering students also may find these courses of value in broadening their perspectives regarding their fields of study and may wish to use them as free electives in their programs.

Undergraduate Course Descriptions (ENGR)

1014: ENGINEERING RESEARCH SEMINAR
Discussion of current research topics in the College of Engineering by Virginia Tech Faculty. Credit earned for this course may not be used to satisfy degree requirements. Pass/Fail only. (1H,1C)

1034: FIRST YEAR HYPATIA SEMINAR
Success strategies that are designed for first-year female engineering students who are residents of the Hypatia learning community are presented. Students are provided information on study skills; resources and academic support for Virginia Tech students; gender issues in engineering; leadership; technology; and the College of Engineering's departments/majors. Credit not applicable to meeting degree requirements. (2H,2C)

1054: FIRST YEAR GALILEO SEMINAR
Success strategies that are designed for first-year male engineering students who are residents of the Galileo learning community are presented. Students are provided information on study skills; resources and academic support for Virginia Tech students; gender issues in engineering; leadership; technology; and the College of Engineering's department/majors. Credit not applicable to meeting degree requirements. (2H,2C)

1814: ENERGY, RESOURCE DEVELOPMENT AND THE ENVIRONMENT
Population trends. Renewable and non-renewable energy. Coal mining methods, reclamation of mined lands. Petroleum and natural gas. Nuclear waste. Land management, aquifer depletion. Development of mineral reserves, surface and underground mining, environmental impacts. Minerals in world economics. Geopolitical concerns. Global environmental effects of industrial enterprises. Sustainable development. Effects of social structures. Regulatory processes and national/international legislation. (3H,3C) I,II.

2044: SECOND YEAR HYPATIA SEMINAR
Success strategies designed for second year women engineering students who are participants of Hypatia, the women in engineering residential community; topics include women in the engineering workplace, leadership, and goals associated with academic and professional success. Credit not applicable to meeting degree requirements. (1H,1C)

2064: GALILEO SEMINAR FOR SOPHOMORES
This course is designed to assist sophomore students who are participants of Galileo, an engineering learning community in their efforts to become/ remain successful students at Virginia Tech. The course will include focus on issues regarding the workplace, leadership, and goals associated with academic and professional success. Credit not applicable to meeting degree requirements. Pre: 1054. (1H,1C)

2984: SPECIAL STUDY
Variable credit course.

3004: MENTORING SEMINAR
Course will prepare engineering students to mentor first year engineering students: focus on leadership and team building skills, study skills development, technology skills engineering departments/majors, college policies and procedures. Credit not applicable to meeting degree requirements. Pass/Fail only. (1H,1C)

3124: INTRODUCTION TO GREEN ENGINEERING
Introduction to green engineering and global environmental issues. Impacts of human and engineering activities on the environment, and techniques that can be utilized to minimize adverse environmental impacts with emphasis on ISO 14000, and environmentally conscious design and manufacturing. Pre: (CHEM 1035 or CHEM 1074), (ENGE 1104 or ENGE 1114), PHYS 2306. (3H,3C)

3134: ENVIRONMENTAL LIFE CYCLE ASSESSMENT
Practical application of life cycle assessment (LCA) to engineering products, processes, and systems. Industrial and government application of LCA. LCA case studies. LCA methodologies including inventory, impact assessment, improvement analysis, and streamlining. LCA applications including life-cycle design, ecolabeling, costing, and public policy in the United States and abroad. Pre: (CHEM 1035 or CHEM 1074), (ENGE 1104 or ENGE 1114), PHYS 2306. (3H,3C)

3984: SPECIAL STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Industrial and Systems Engineering

University Exemplary Department

ise.vt.edu

G. Don Taylor, Jr., Head and Charles O. Gordon Professor
E.M. Van Aken, Associate Head and Undergraduate Program Director
C.P. Koelling, Assistant Head and Graduate Program Director
University Distinguished Professor and W. Thomas Rice Professor: H.D. Sherali
John Grado Professor: J.G. Casali
John W. Hancock, Jr. Chair: P.E. Torgersen
Paul T. Norton Professor: S.C. Sarin
Professors: B.M. Kleiner; M.A. Nussbaum; R. Sturges; K.P. Triantis
Associate Professors: E.K. Bish; K.P. Ellis; L.K. Harmon; C.P. Koelling; T.E. Lockhart; J.A. Nachlas; J.P. Shewchuk; T. Smith-Jackson; M.R. Taaffe; E. M. Van Aken
Assistant Professors: M.J. Agnew; D.R. Bish; J.A. Camelio; Y. Merzifonluoglu; R. Pasupathy; C. Wernz; W. W. Winchester, III
Faculty Affiliates[1]: D.Y. Gao; J. Terpenny; D. Young
Adjunct Faculty: B. Fraticelli; J. Godfrey; C. Martin; J. Meredith; L. Travis
Professors Emeritus: B.S. Blanchard; M.P. Deisenroth; W.J. Fabrycky; P.T. Kemmerling; K.H. E. Kroemer; H.A. Kurstedt; D. L. Price; J.W. Schmidt, Jr.; H. L. Snyder; W.G. Sullivan; W.W. Wierwille; R.C. Williges
Associate Professor Emeritus: P. Ghare; M.L. Spengler
Academic Advisor: J. Vest
[1]Faculty with regular appointments in other departments

Overview

The Grado Department of Industrial and Systems Engineering advances the discipline and imparts knowledge to students, peers and practitioners. In an environment that fosters leadership, achievement, and diversity, we:

1. Prepare undergraduate and graduate students for life-long success and leadership in the profession, in industry, and in higher education;
2. Conduct and disseminate research that promotes the economic prosperity and well-being of Virginia and the nation; and
3. Provide valuable services to industry, society, and the ISE profession.

Industrial and systems engineering is one of the most diverse fields in engineering. ISE is concerned with the design, improvement, and installation of integrated work systems of people, materials, equipment and technology, processes, information, and capital. The industrial engineer is concerned with creating value and improving performance of integrated systems, whether that involves improving quality and productivity, reducing costs and non-value adding activities, improving customer satisfaction, or improving worker safety.

The applications for industrial engineering capabilities include industry, government, and service organizations. Graduates of the ISE program at Virginia Tech work in manufacturing facilities, distribution warehouses, hospitals, airlines, railroads, banks, amusement parks, the military, federal government, and management consulting firms, among others. The boundaries of where IEs make contributions are limitless.

The mission of the ISE Undergraduate Program is to prepare industrial and systems engineering students to create value for organizations, the profession, and society. We achieve this mission by recruiting, retaining, and educating high quality and diverse students and by creating a rigorous and collegial environment enabling students to learn industrial engineering methods and tools, built upon a foundation of mathematical, physical, and engineering sciences, and to apply them in any global organizational setting. Students are able to achieve academic and professional success through opportunities to participate in various educational experiences, to develop capabilities as future leaders, and to embark on a lifelong journey of professional development and learning.

Program Educational Objectives and Program Outcomes

The ISE faculty, with input from our external Advisory Board, employers, and students, have defined the following Program Educational Objectives (PEOs) and Program Outcomes for our Undergraduate Program . PEOs are statements that describe the expected accomplishments of ISE graduates within 3-5 years after graduation. Program Outcomes are statements that describe what students are expected to know and be able to do at the time of graduation.

Program Educational Objectives: Within 3-5 years of graduation, ISE alumni will have:

1. Created value by applying the appropriate industrial engineering tools to design/redesign integrated systems/processes, solve problems, and improve results.
2. Provided formal and informal leadership to their respective organization.
3. Stayed current by pursuing professional development through graduate study, professional certification, and continuing education.
4. Communicated effectively using written, oral, and visual media adapted to different audiences and stakeholders.
5. Worked effectively in cross-functional team environments comprised of members with varying organizational backgrounds, positions, and geographic locations.
6. Served the profession, community, and society.

Program Outcomes: At the time of graduation, ISE students will have the:

1. Ability to apply computational and industrial engineering tools and techniques encompassing manufacturing systems, operations research, human factors and ergonomics, and management systems.
2. Ability to apply knowledge of mathematics, statistics, and physical and social sciences to IE problems.
3. Ability to identify, formulate, and solve structured and unstructured IE problems.
4. Ability to model, analyze, and evaluate work systems and processes, using appropriate experimental design, measurement tools/ techniques, and data.
5. Ability to generate and evaluate alternatives to design an integrated work system or process through a systems perspective.
6. Ability to evaluate the impact of IE solutions in the broader context of the organization and society, with an appreciation of different cultures and perspectives.
7. Knowledge of the role of industrial engineers in contemporary issues.
8. Ability to communicate effectively to a variety of audiences and using written, oral, and visual media.
9. Understanding of professionalism, good citizenship, and ethical behavior.
10. Ability to work collaboratively in multi-disciplinary teams.
11. Understanding of the need for continued professional development and ability to engage in life-long learning.

The Industrial and Systems Engineering program at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

Curriculum

The ISE curriculum explicitly encompasses coursework useful in addressing not only the technical elements of work systems, but also the organizational, economic, and human elements. Our aim is to provide graduates with the knowledge and capabilities to enable them to successfully pursue careers in industrial engineering or, if qualified, to continue on to graduate study.

ISE emphasizes instruction in fundamental engineering principles based on the physical sciences, engineering sciences, mathematics, and statistics. These principles are applied in practical design experiences throughout the undergraduate curriculum.

Course work in the physical and chemical sciences and mathematics provides a solid background for basic engineering science courses, which in turn support more focused courses in industrial engineering, covering topics in operations research, manufacturing systems, human factors engineering and ergonomics, and management systems. In all these areas, analysis and design activities are supported by modern computing and software tools taught in the curriculum.

Students gain valuable hands-on, laboratory experience in manufacturing processes, work methods, computer simulation, and human factors engineering. State-of-the-art laboratory facilities associated with the undergraduate curriculum include the ISE Computer Laboratory, which contains computers and printers to support the needs and requirements of ISE students that are not available through access to personal computers or in other laboratories; the Senior Design Center, with computer support and other resource material for student design projects; the Manufacturing Systems Engineering Laboratories, which contain robotics and automation equipment, machining equipment, conventional and numerically controlled machine tools, and welding and foundry facilities; the Human Factors Work Measurement and Methods Engineering Laboratory, which is equipped and used for in-class exercises and experiments in work measurement, motion economy and time study, psychophysics, human audition and vision, and work station design.

The capstone course in the ISE Undergraduate Program is a two-semester class, ISE 4005-6 Project Management & System Design (also referred to as “Senior Design”), where students work in project teams with an external company sponsor to solve a real-world problem. This experience provides ISE students with actual project experience that develops technical and professional skills, such as teamwork, communication, project management, and life-long learning skills, in addition to developing capabilities in applying IE tool and techniques. Student project teams present their project findings at our annual Senior Design Symposium attended by company sponsors and the ISE

Advisory Board.

The course work totals 136 hours and includes 21 credit hours of electives and 13 credit hours of Curriculum for Liberal Education Area electives, providing students with the opportunity to explore other areas of engineering, as well as cultural, societal and creative experiences, which makes for a well-rounded, diverse, and globally-aware engineer.

The ISE program also provides students with the opportunity to pursue minors, such as a Business Minor, Green Engineering Minor or Math Minor. More specific information about minors available to ISE students can be found in the ISE Undergraduate Student Handbook, posted on the ISE web site. Students and employers alike are seeing the benefits of these minors for adding value to the ISE major.

Many ISE students seek to participate in Undergraduate Research to satisfy elective requirements in the curriculum. The opportunity to work more closely, in some cases on a one-on-one basis, with our outstanding faculty can provide more in-depth development of ISE capabilities and a more enriching educational experience. Each year, about 15% of ISE students participate in Undergraduate Research, with almost one-third of students having participated in an Undergraduate Research experience by the time they graduate.

The department participates in the Cooperative Education Program, in which qualified students may alternate semesters of study with semesters of professional co-op employment or internships. Students are encouraged to pursue these experiences before they graduate to make them more competitive in the work force. Students are also encouraged to participate in career fairs and job interviews on and off campus.

The ISE department also provides students with many significant scholarship opportunities at the undergraduate and graduate levels to encourage and acknowledge high academic performance and achievements.

Graduate programs leading to the M. Engr., M.S., and Ph.D. are offered (see Graduate Catalog). The graduate programs include concentrations in manufacturing systems, human factors engineering and ergonomics, operations research, management systems, and general IE. The ISE Department also coordinates on- and off-campus master's degree programs in systems engineering (M.S.) and engineering administration (M.E.A.).

Program Requirements

The required classes for the ISE undergraduate degree are shown below for each year. These requirements are based on the ISE 2010 Checksheet for students graduating in 2010 and 2011. Students completing the BSISE curriculum prior to 2010 or after 2011 should consult the appropriate checksheet (available on the ISE web site or in the ISE Academic Advisor’s office).

First Year	
First Semester	
ENGL 1105: English I	3
CHEM 1035: General Chemistry for Engineers	3
CHEM 1045: General Chemistry Lab for Engineers	1
MATH 1114: Linear Algebra	2
MATH 1205: Calculus I	3
ENGE 1024: Engineering Exploration	2
Elective	3
Credits	**17**
Second Semester	
ENGL 1106: English II	3
PHYS 2305: Foundations of Phys I w/lab	4
MATH 1206: Calculus II	3
MATH 1224 Vector Geometry	2
ENGE 1104: Exploration Digital Future or ENGE 1114: Exploration Engineering Design	2
Elective(s)	3
Credits	**17**
Second Year	
First Semester	
PHYS 2306: Foundations of Phys II w/Lab	4
MATH 2224: Multivariable Calculus	3
ISE 2014: Engineering Economy	2
ENGE 2314: Eng. Problem Solving w/ C++	2

ENGE 2344: Computer-Aided Drafting	1
ESM 2104: Statics	3
Credits	**15**
Second Semester	
MATH 2214: Differential Equations	3
STAT 4105: Theoretical Statistics	3
ISE 2204: Manufacturing Processes	2
ISE 2214: Manufacturing Processes Lab	1
ISE 2404: Deterministic Operations Research	3
ESM 2304: Dynamics	3
MSE 2034: Materials Engineering	3
Credits	**18**
Third Year	
First Semester	
STAT 4706: Statistics for Engineers	3
ISE 3014: Work Measurement and Methods Engr	3
ISE 3414: Probabilistic Operations Research	3
ISE 3614: Intro to Human Factors Engineering	3
ECE 3054: Electrical Theory	3
Elective	1
Credits	**16**
Second Semester	
ISE 3214: Facility Planning and Material Handling	3
ISE 3424: Discrete-Event Computer Simulation	3
ISE 3624: Industrial Ergonomics	3
ISE 3024: Data Mgt for Industrial Engineers	3
Electives	6
Credits	**18**
Fourth Year	
First Semester	
ISE 4005: Project Management and Sys. Design	3
ISE 4204: Prod. Planning and Inventory Control	3
ISE 4404: Statistical Quality Control	3
Electives	9
Credits	**18**
Second Semester	
ISE 4006: Project Management and Sys. Design	2
ISE 4304: Global Issues in Indus. Mgt.	3
Electives	12
Credits	**17**

Notes:
a) These program requirements are based on the ISE 2010 Checksheet which is applicable for students graduating in 2010 and 2011; students graduating before 2010 or after 2011 should see the ISE Academic Advisor;
b) A grade of C- or better must be obtained in core ISE, STAT, and MATH courses that are prerequisites for more advanced ISE courses (see Catalog descriptions for specific prerequisite requirements for each course);
c) Electives must be taken to satisfy the 13 credit hours of Curriculum for Liberal Education Area requirements, 6 credit hours of Non-Technical Electives, 6 credit hours of Engineering Science Electives, 3 credit hours of Technical Electives, and 6 credit hours of ISE Technical Electives – students should refer to the ISE Undergraduate Student Handbook and ISE 2010 Checksheet for specific requirements in each Elective area;
d) For more information about the ISE curriculum and requirements, contact the ISE Academic Advisor at 540/231-6388 or the ISE department at 540/231-6656.

Undergraduate Course Descriptions (ISE)

2014: ENGINEERING ECONOMY
Concepts and techniques of analysis for evaluating the worth of products, systems, structures, and services in relation to their cost. Economic and cost concepts, calculating economic equivalence, comparison of alternatives, replacement economy, economic optimization in design and operations, and after-tax analysis. Pre: ENGE 1024. (3H,2C)

2204: MANUFACTURING PROCESSES
Survey of manufacturing processes, including casting, forming, machining, joining, and nontraditional processes such as laser and electrical discharge machining. Emphasis on process capabilities and limitations and design for manufacturability. Also includes topics in product design, material selection, process planning, and manufacturing automation. Pre: ENGE 1104 or ENGE 1114. (2H,2C) I,II.

2214: MANUFACTURING PROCESSES LABORATORY
Laboratory exercises and experimentation in manufacturing processes. Emphasis on metrology, casting and molding, forming, machining, welding and computer-aided manufacturing. Pre: ENGE 1104 or ENGE 1114. (3L,1C) I,II.

2404: DETERMINISTIC OPERATIONS RESEARCH
Deterministic operations research modeling concepts; linear programming modeling, assumptions and algorithms, duality and sensitivity analysis with economic interpretation; transportation and assignment problems; convexity issues, optimality conditions for continuous unconstrained and constrained nonlinear optimization problems, numerical optimization methods; and discrete optimization concepts. Co: MATH 2224. (3H,3C) II,III.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3004: INDUSTRIAL COST CONTROL
Fundamentals of general and cost accounting practices applied to manufacturing and service organizations. Cost accounting, standard cost determination, cost and budgetary control systems. A grade of C- or better required in prerequisite ISE 2014. Pre: 2014 or ME 2024. (4H,3C) II.

3014: WORK MEASUREMENT AND METHODS ENGINEERING
Survey of methods for assessing and improving performance of individuals and groups in organizations. Techniques include various basic industrial engineering tools, work analysis, data acquisition and application, performance evaluation and appraisal, and work measurement procedures. A grade of C- or better required in prerequisites ISE 2204 and 2214 and STAT 4105. Pre: (2204 or 2214), STAT 4105. (2H,3L,3C) I,III.

3024: DATA MANAGEMENT FOR INDUSTRIAL ENGINEERS
Investigation of data modeling, storage, acquisition, and utilization in Industrial Engineering via manual and computerized methods. Development of effective spreadsheet applications using Excel. Design and implementation of relational databases via E-R modeling, relational schema, normalization, SQL, and MS Access. Web-based database applications using HTML, JavaScript, and ASP. Interface design and the system development life cycle applied to data management applications. All topics covered within the context of typical Industrial Engineering problems. A grade of C- or better is required in ISE 2214. Pre: 2214, ENGE 2314. Co: 3214. (3H,3C)

3214: FACILITY PLANNING AND MATERIAL HANDLING
Theory and concepts involved in model formulation for design and analysis of facility plans. Includes facility layout, facility location and material handling system design. Application of quantitative tools and techniques for flow analysis, layout planning, and automated material handling system design. A grade of C- or better required in ISE prerequisites 2014, 2404, and 3414. Pre: 2014, 2404, 3414, ENGE 2344. Co: 3424. (3H,3C) II,IV.

3414: PROBABILISTIC OPERATIONS RESEARCH
This course introduces probability models used to investigate the behavior of industrial systems. The major topics include conditioning, elementary counting processes and Markov chains. Emphasis is on the use of these tools to model queues, inventories, process behavior and equipment reliability. A grade of C- or better required in STAT 4105, MATH 2214 and MATH 2224. Pre: ENGE 2314, MATH 2214, MATH 2224, STAT 4105. (3H,3C) I,III.

3424: DISCRETE-EVENT COMPUTER SIMULATION
Introduction to the analysis of systems through discrete simulation. Topics include an introduction to systems analysis and modeling, random variable generation, model development, and testing and problem analysis through simulation. A grade of C- or better required in ISE prerequisite 3414. Pre: 3414. Co: STAT 4706. (2H,3L,3C) II,IV.

3614: INTRODUCTION TO HUMAN FACTORS ENGINEERING
Survey of human factors engineering emphasizing the systems approach to workplace and machine design. Discussion of basic human factors research and design methods, visual processes and design methods, selection of statistical techniques for application to human factors data, visual and auditory processes, display and control design and effects of environmental stressors on humans. A grade of C- or better required in STAT 4105. Pre: STAT 4105. (2H,3L,3C) I,IV.

3624: INDUSTRIAL ERGONOMICS
Introduction to ergonomics with an emphasis on people at work. Discussion of ergonomic methods for measurement, assessment, and evaluation, with major topics including manual materials handling, cumulative trauma disorders, environmental stresses, safety, and legal issues. A grade of C- or better required in ISE prerequisite 3014. I,II. Pre: 3014, ESM 2104. (3H,3C)

4004: THEORY OF ORGANIZATION
A theory of cooperative behavior in formal organizations, including the structure and elements of formal organizations. The executive process and the nature of executive responsibility also are examined. I, II. (3H,3C)

4005-4006: PROJECT MANAGEMENT & SYSTEM DESIGN
The capstone design sequence for ISE majors. Survey of methods, tools and techniques used to plan, communicate, manage and control projects. Students work in teams to develop a proposal for and implement an industrial engineering design project for actual manufacturing or service industry clients. A grade of C- or better required in ISE prerequisites 3214, 3424, 3024 and 3614. Pre: 3024, 3214, 3424, 3614 for 4005; 4005 for 4006. Co: 4204, 3624 for 4005. 4005: (3H,3C) 4006: (2H,2C)

4015,4016: MANAGEMENT SYSTEMS THEORY, APPLICATIONS, AND DESIGN
Systems approach to management, domains of responsibility, structured and synergistic management tools, management system model, contextual frameworks, information portrayal, automation objectives model, evaluation, shared information processing, information modeling. A management process for definition, measurement, evaluation and control, the organization as an information processor, corporate culture, scoping agreements, schemas and management elements, structured design. I (3H,3C)

4204: PRODUCTION PLANNING AND INVENTORY CONTROL
Theory and concepts involved in model formulation for analysis and control of production processes. Systems for planning and controlling production and inventory including material requirements planning (MRP), just-in-time (JIT), and synchronous production systems. A grade of C- or better is required in prerequisite ISE 2404 and STAT 4706. I. (3H,3C)

4234: MODELING AND SIMULATION LANGUAGES
Modeling of industrial situations and introduction to the use of simulation languages. Several simulation languages commonly used for industrial engineering applications such as GPSS, SLAM, and SIMAN will be covered. A grade of C- or better required in prerequisite ISE 3424. Pre: 3424. (3H,3C)

4244: FUNDAMENTALS OF COMPUTER INTEGRATED MANUFACTURING
Concepts and techniques for modeling, designing, and implementing Computer Integrated Manufacturing (CIM) systems. Emphasis on relational databases and communications networks and their use in modern manufacturing enterprises. Fundamentals and role of Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Aided Process Planning (CAPP) in CIM systems. A grade of C- or better required in ISE prerequisites 2204, 2214 and 4204. Pre: (2204 or 2214), (4204). (3H,3C)

4264: INDUSTRIAL AUTOMATION
A survey of the various technologies employed in industrial automation. This includes an emphasis on industrial applications of robotics, machine vision, and programmable controllers, as well as an investigation into problems in the area of CAD/CAM integration. Examination of the components commonly employed in automation systems, their aggregation and related production process design. Laboratory work is required. A grade of C- or better required in prerequisites ISE 2204 or 2214. Pre: 2204 or 2214. (2H,3L,3C)

4304: GLOBAL ISSUES IN INDUSTRIAL MANAGEMENT
Industrial management topics of current interest explored from a global perspective. Current domestic and international challenges resulting from a global marketplace and the proliferation of information and technology. Industrial management and organizational performance, total quality management, business process re-engineering, leadership, organizational change, role of communication and information, and ethics. Examination and comparison across international boundaries. (3H,3C) II.

4404: STATISTICAL QUALITY CONTROL
Application of statistical methods and probability models to the monitoring and control of product quality. Techniques for acceptance sampling by variables and attributes are presented. Shewhart control charts for both classes of quality characteristics are examined in depth. The motivation for each method, its theoretical development, and its application are presented. The focus is upon developing an ability to design effective quality control procedures. A grade of C- or better required in ISE 3414, STAT 4105, and STAT 4706. Pre: 3414, STAT 4105, STAT 4706. (3H,3C) I.

4414: INDUSTRIAL QUALITY CONTROL
Implementation of statistical quality control techniques in an industrial setting. Development and analysis of cost models for use in the design of optimal quality control plans. Also included are new techniques, advanced quality control models, and an examination of the role of industrial statistics in the overall product quality assurance function. A grade of C- or better required in prerequisite ISE 4404. Pre: 4404. (3H,3C)

4424: LOGISTICS ENGINEERING
Introduction to the key issues in the integrated support of a product of process. Synthesis of topics from earlier studies to provide a cohesive approach to their applications. Logistics engineering provides a survey of product support issues and methods of resolving them within the context of the overall production activity. A grade of C- or better required in prerequisite ISE 3414. Pre: 3414. (3H,3C)

4624: WORK PHYSIOLOGY
Anthropometry, skeletal system, biomechanics, sensorimotor control, muscles, respiration, circulation, metabolism, climate. Ergonomic design of task, equipment, and environment. A grade of C- or better required in prerequisite ISE 3614. Pre: 3614. (3H,3C)

4644: OCCUPATIONAL SAFETY AND HAZARD CONTROL
Survey of occupational safety. Topics include: history of occupational safety; hazard sources related to humans, environment, and machines; engineering management of hazards. A grade of C- or better required in prerequisite ISE 3614. Pre: 3614. (3H,3C) II.

4654: PRINCIPLES OF INDUSTRIAL HYGIENE
Introduction to the foundations of the field of Industrial Hygiene, that discipline devoted to the anticipation, recognition, measurement, evaluation, and control of occupational health hazards. Includes biological (e.g. microbial agents, allergens), chemical (e.g. solvents, carcinogens, dusts), and physical (e.g. radiation , temperature) hazards. Overview of control of health hazards, such as personal protective equipment, administrative controls, and engineering controls. Will involve lecture and participatory "case-study" activities. Will provide ample opportunity for hands-on use of monitoring equipment, protective equipment and controls testing devices. II. (3H,3C)

4974: INDEPENDENT STUDY

Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Engineering

Materials Science and Engineering

www.mse.vt.edu
E-mail: undergrad@mse.vt.edu

University Exemplary Department
D.E. Clark, Head
Virginia Tech Samuel P. Langley Professor: K.V. Logan
Professors: D.E. Clark; N.E. Dowling[1]; D. Farkas; P. Gatenholm; R.W. Hendricks[2]; G-Q. Lu[2]; W.T. Reynolds, Jr.; D.D. Viehland
Associate Professors: A.O. Aning; L.V. Asryan; S.G. Corcoran; L.J. Guido[2]; G.R. Pickrell; S. Priya[3]
Assistant Professors: J.T. Abiade[3]; P.K. Lu; A.W. Morgan[4]; Y. Wang
Research Associate Professors: J-F. Li; C.T.A. Suchicital
Research Assistant Professor: J.P. Schultz
Instructor: C.B. Burgoyne[1]
Professors Emeritus: J.J. Brown, Jr.; R.O. Claus; G.V. Gibbs; D.P.H. Hasselman; C.W. Spencer
Adjunct Faculty: M.J. Bortner; D. Finch; M.M. Julian; R.G. Kander; S.L. Kampe; M.J. Kelley; T.K. Ooi; H.F. Wu
Affiliated Faculty[5]: R.C. Batra[a]; S.W. Case[a]; J.R. Heflin[b]; H. Marand[c]; M.C. Paretti[d]; R.H. Yoon[e]
[1] Joint appointment with Electrical and Computer Engineering
[2] Joint appointment with Engineering Science and Mechanics
[3] Joint appointment with Chemical Engineering
[4]Joint appointment with Geosciences
[5] Faculty with regular appointments in other departments: (a) Engineering Science and Mechanics; (b) Physics; (c) Chemistry; (d) Engineering Education; (e) Mining and Minerals Engineering

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Overview

Materials engineers and scientists study the structure and properties of engineering materials on scales ranging from the atomic through the microscopic to the macroscopic. These materials include ceramics, metals, polymers, composites, biomaterials, semiconductors, electronic, magnetic, and photonic materials. Materials engineers develop new materials, improve traditional materials, and manufacture materials economically through synthesis, processing, and fabrication. They seek to understand physical and chemical phenomena in material structures and to measure and characterize materials properties of all kinds including mechanical, electrical, optical, magnetic, thermal, and chemical. They predict and evaluate the performance of materials as structural or functional elements in engineering systems and structures. Because the performance of virtually all engineered products depends upon the properties of the various materials which make up the components of the system, engineering and technological advances are commonly limited by the properties and cost of the manufactured materials which are currently available. As a consequence, the discipline of materials science and engineering is central and critical to the success of several identified strategic national quality-of-life initiatives, including biotechnology, nanotechology, energy, information technology, vehicular transportation systems, national defense and security, and environmental stewardship.

Significant opportunities exist for graduates in the aerospace, automobile, transportation, medical, microelectronics, telecommunications, chemical, petroleum, energy storage, power generation, and energy conservation industries, as well as within the basic industries producing materials--for example, the copper, aluminum, steel, ceramics, glass, and polymer industries. Opportunities also exist in government-operated engineering centers and research laboratories. Graduates work in entry level engineering, manufacturing, materials selection and design, quality assurance and control, research and development, technical consulting, management, and sales and marketing. Graduates have an excellent background for post-graduate studies in science, engineering, medicine, law, and business.

At Virginia Tech, the MSE Department's mission is to lead the multidisciplinary efforts of the College of Engineering, the University, and the Commonwealth in the field of Materials Science and Engineering through our programs of undergraduate and graduate education, research, and continuing education. In service to our many constituencies, we are committed to the excellence of the contributions of faculty members, staff, and students, as judged by the principles and philosophies to which we aspire.

The courses comprising the MSE undergraduate curriculum deliver a wide range of specific learning objectives that comprehensively capture

the outcomes necessary for successful careers within the MSE discipline. A listing of the MSE Program outcomes and how they are addressed within the curriculum can be found at http://www.mse.vt.edu/academics/curriculum/objectives.html. The MSE Program at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410) 347-7700.

Students of MSE can optionally participate in the cooperative education program in which qualified students may alternate semesters of study with semesters of professional employment. Study-abroad opportunities are also possible. Honors-eligible students may participate in a formalized program of study leading to one of several university honors degrees (see http://www.univhonors.vt.edu).

The Commonwealth of Virginia participates in the Academic Common Market, a coalition of 10 Southern Regional Education Board states. Students majoring in materials science and engineering who are residents of the state of West Virginia or Delaware may be eligible for Virginia in-state tuition. Contact the Office of the University Registrar for further information.

The Department of Materials Science and Engineering offers scholarships to students with high academic achievements. A number of undergraduate scholarships are awarded each year, including the prestigious Micron Scholars Awards for outstanding students with career interests in microelectronics.

Programs are available for graduate work leading to the M.S., M.E., and Ph.D. in materials science and engineering. Please see the Graduate Catalog for more information on any of these advanced degree programs.

Further information about the department, its degree programs, students, and faculty may be found at http://www.mse.vt.edu.

Educational Objectives of the MSE Program

To prepare its graduates for successful careers as practicing professionals in engineering or complementary fields, the MSE Department at Virginia Tech offers a curriculum developed to meet the following educational objectives:

- To prepare our graduates for successful careers in engineering practice or subsequent graduate study by providing a broad, innovative, and quality education in material science and engineering.
- To prepare our graduates with a strong foundation in materials science and engineering, with emphasis on the fundamental scientific and engineering principles which maintain relevance over time and underlie the knowledge and implementation of material structure, processing, properties, and performance of all classes of materials used in engineering systems.
- To prepare our graduates for a broad range of materials-related career opportunities by providing ample flexibility within the program of study to enable interest-driven specialization, program customization, and educational experimentation.
- To prepare our graduates to particpate in all aspects of engineering design (electronic, atomistic, molecular, microstructural, mesoscopic, and macroscopic) that involve materials, as well as the design of material processes and systems.
- To prepare our graduates for professional practice through extensive hands-on laboratory experiences and effective, integrated instruction of communication skills, and the ability to learn new skills and attain new knowledge as technology evolves.
- To prepare our students to participate as leaders in a diverse global workplace, and to provide them with an awareness of the environmental, societal, and ethical implications of engineering practice.

The Materials Science and Engineering Checksheet

Students typically enter the MSE Department following completion of their first year studies within the College of Engineering, as administered by the Department of Engineering Education (EngE); a description of required first year coursework can be found within the EngE section of this catalog.

In addition to foundation courses in MSE, students tailor an invidualized program of elective study. Fifteen credits of technical electives will be selected to emphasize certain subdisciplines of MSE (e.g., metals, ceramics, polymers, electronic materials, composites, biomaterials, nanomaterials, etc.) or to prepare for a career in certain application areas (e.g., manufacturing, aerospace, automotive, information technology, microelectronics, etc.).

The undergraduate curriculum contains a nationally-recognized integrated program of instruction in engineering communication including writing, public speaking, proposal preparation, reporting, research skills, critical and creative thinking, and graphical presentation. More information regarding this unique program can be found at http://www.mse.vt.edu/communications.

(This program of study applies to students graduating in 2010)

First Year	
First Semester	
CHEM 1035: General Chemistry I	(3)
CHEM 1045: General Chemistry Lab I	(1)

ENGE 1024 Engineering Explorations	(2)
ENGL 1105 Freshman English I	(3)
MATH 1114: Linear Algebra	(2)
MATH 1205: Calculus I	(3)
CLE Elective - (Area 6)	(1)
Total Credits	(15)
Second Semester	
ENGE 1114: Exploration of Engineering Design	(2)
ENGL 1106: Freshman English II	(3)
MATH 1224: Vector Geometry	(2)
MATH 1206: Calculus II	(3)
PHYS 2305: Foundations of Physics I	(4)
CLE Elective - (Area 2/3)	(3)
Total Credits	(17)
Second Year	
First Semester	
MSE 2044: Fund of Materials Engineering[1]	(3)
MSE 2884: Mater Eng Professional Dev. I	(1)
ESM 2104: Statics	(3)
MATH 2224: Multivariable Calculus	(3)
PHYS 2306: Foundations of Physics I	(4)
CLE Elective - (Area 2/3)	(3)
Total Credits	**(17)**
Second Semester	
MSE 3304: Physical Metallurgy	(3)
MSE 3314: Materials Lab I	(1)
CHEM 1036: General Chemistry II	(3)
ECE 3054: Electrical Theory	(3)
ESM 2204: Mechanics of Deformable Bodies	(3)
MATH 2214: Intro Differential Equations	(3)
Program Elective [2]	(2)
Total Credits	**(18)**
Third Year	
First Semester	
MSE 2054: Fundamentals of Materials Science	(3)
MSE 3134: X-ray Diffraction	(3)
MSE 4034: Thermodynamics of Materials	(3)
MSE 4414: Physical Ceramics	(3)
MSE 4424: Materials Lab II	(1)
ISE 2214 Manufacturing Processes Lab	(1)
CLE Elective (Area 2/3)	(3)
Total Credits	**(17)**
Second Semester	
MSE 3044: Transport Phenomena in MSE	(3)
MSE 3054: Mechanical Behavior of Materials	(2)
MSE 3064: Mechanical Behavior Laboratory	(1)
MSE 3884: Mater Eng Prof. Dev. II	(1)
MSE 4354: Strength and Fracture	(1)

MSE 4554: Polymer Engineering	(3)
Technical Elective[3]	(3)
Total Credits	**(14)**
Fourth Year	
First Semester	
MSE 4055: Materials Selection & Design I	(3)
MSE 4075: Senior Design Laboratory I[4]	(1)
MSE 4085: Senior Design Recitation	(2)
MSE 4900: Communications in MSE	(1)
Elective (Area 2/3)	(3)
Technical Electives[3]	(6)
Total Credits	**(16)**
Second Semester	
MSE 4056: Materials Selection & Design II	(3)
MSE 4076: Senior Design Laboratory II[4]	(1)
MSE 4086: Senior Design Recitation II	(1)
ISE 2014: Engineering Economy [5]	(2)
Technical Electives [3]	(6)
CLE Elective - (Area 7)	(3)
Total Credits	**(16)**

A total of 130 credit hours are required for graduation.
There are no hidden prerequisites in this checksheet.
Notes:
[1]Transfer students from another department or university may conditionally substitute MSE 2034 for MSE 2044.
[2]Program Elective - Choose EF 2314 C++ (2); STAT 3704 Statistics for Eng (2); ME/MATH 2004 Eng Analysis Using Numerical Methods (2); or ESM 2074 Computational Methods (3).
[3]All technical electives must be taken for a grade (Pass/Fail not acceptable)
[4]Honors students may substitute MSE 4095-96 Honors Senior Design Lab I,II for MSE 4075-76.
[5]Students may substitute ECON 2005 Microeconomics (3) for ISE 2014 if not used for an Area 3 elective.

Progress towards the Degree

In addition to University policy, a student must pass MSE 2044, 2884, 3304, and 3314 with a collective GPA of at least 2.0 in order to demonstrate satisfactory progress toward a degree. Students failing to meet this requirement must repeat a sufficient number of the courses with grades below C before they will be permitted to take any other courses in the major. For graduation, a student must maintain an overall GPA of 2.0 and a GPA of 2.0 in all MSE courses.

Undergraduate Courses (MSE)

1004: MATERIALS IN TODAY'S WORLD
An introductory course designed for the student with a basic high school science background who wishes to understand and learn about the exciting materials developments which are affecting us all in today's world. The course will introduce the structures and properties of metals, ceramics, polymers (plastics), composites, and materials for electronic and optical applications. Students will also gain an appreciation for the processing and design limitations of materials used in everyday applications. (1H,1C)

2014: MATERIALS ENGINEERING TRANSITION
Supplemental coverage of introductory topics not included in courses delivered to non-MSE majors. Pre: 2034 or 3094 or AOE 3094. (1H,1C)

2034: ELEMENTS OF MATERIALS ENGINEERING
This course is designed to introduce the non-MSE student to the structures and properties of metals, ceramics, polymers, and composites. In addition, students will gain an understanding of the processing and design limitations of these materials, as well as being introduced to new classes of materials being developed to meet the ever expanding range of material requirements. Non-MSE majors only. Pre: CHEM 1035. Co: PHYS 2305. (3H,3C)

2044: FUNDAMENTALS OF MATERIALS ENGINEERING
This course is designed to introduce the MSE major to the structures and properties of metals, ceramics, polymers, composites, and electronic materials. Students will also gain an understanding of the processing and design limitations of materials. Topics fundamental to the further study of

materials, such as crystal structures, phase diagrams, and materials design and processing will be emphasized as foundations for future MSE courses. Pre: CHEM 1035. Co: PHYS 2305. (4H,4C)

2054: FUNDAMENTALS OF MATERIALS SCIENCE
Introduces MSE majors to fundamental underlying concepts governing phase equilibrium, microstructure, electronic properties of materials, and transport phenomena as a foundation to understanding materials behavior and processing. Pre: 2044, CHEM 1035, PHYS 2305. (3H,3C)

2884: MATERIALS ENGINEERING PROFESSIONAL DEVELOPMENT I
Library engineering research skills, technical computer graphics, basic engineering workplace communication skills, basic engineering teamwork skills, introduction to engineering ethics, resumes and letters of introduction, gender issues in the workplace, professional poster presentations, and engineering public speaking. Pre: MSE major, sophomore status. (3L,1C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3004H: MATERIALS IN TOMORROW'S WORLD
The role of materials and materials development in society and technological progress. The role of research in the solutions to pressing global, materials-related scientific and engineering challenges. New and envisioned materials forms developed in response to present and future applications needs, and the ethical, environmental and energy implications thereof. Pre-requisite: Honors students enrolled in the sciences or engineering. Pre: CHEM 1035, PHYS 2305. (3H,3C)

3044: TRANSPORT PHENOMENA IN MSE
Mass transport (continuum and atomistic diffusion), heat transport and fluid flow (momentum transport). Analytical and computer based methods for solving transport problems. Pre: 2034 or 2044, MATH 2214. (3H,3C)

3054 (ESM 3054): MECHANICAL BEHAVIOR OF MATERIALS
Mechanical properties and behavior of engineering materials subjected to static, dynamic, creep, and fatigue loads under environments and stress states typical of service conditions; biaxial theories of failure; behavior of cracked bodies; microstructure-property relationships and design methodologies for homogeneous and composite materials. Pre: ESM 2204. (2H,2C)

3064 (ESM 3064): MECHANICAL BEHAVIOR OF MATERIALS LABORATORY
Laboratory experiments on mechanical properties and behavior of homogenous and composite engineering materials subjected to static, dynamic, creep, and fatigue loads; behavior of cracked bodies; microstructure-property relationships, and determination of materials properties for use in engineering design. Co: 3054. (3L,1C)

3094 (AOE 3094): MATERIALS & MANUFACTURING FOR AERO & OCEAN ENGINEERS
This course introduces the student of Aerospace and/or Ocean Engineering to the fundamental properties of materials typically required for structural design. The performance characteristics of metals, ceramics, polymers, and composites are presented and contrasted. Foundation principles underlying materials manufacturing are also presented with the goal of providing an understanding of how processing affects material properties and performance. Must have a C- or better in pre-requisite CHEM 1035. Pre: CHEM 1035. Co: ESM 2204, PHYS 2305. (3H,3C)

3104 (GEOS 3504): MINERALOGY
Principles of modern mineralogy, crystal chemistry, and crystallography, with emphasis on mineral atomic structure and physical property relationships, mineralogy in the context of geology, geochemistry, environmental science and geophysics, phase equilibria, mineral associations, and mineral identification, and industrial applications of minerals. There are three required field trips during the semester. Pre: MATH 1016, CHEM 1036. (2H,3L,3C)

3124 (GEOS 3524): OPTICAL MINERALOGY
Principles of color and the behavior of light in crystalline materials; use of the petrographic microscope in the identification of minerals using optical techniques. Pre: GEOS 1004. Co: GEOS 3504. (3L,1C)

3134: INTRODUCTION TO SYMMETRY AND X-RAY POWDER DIFFRACTION
Introduction to x-ray diffraction; fundamentals, experimental methods, and applications. Pre: (2034 or 2044). (3H,3C)

3204: FUNDAMENTALS OF ELECTRONIC MATERIALS
Introduction to the electrical, magnetic, and optical properties of solid-state materials. Development of atomic scale models for physical phenomena that are observable at the macroscopic scale. Connection is made between basic materials properties and the operational characteristics of selected solid-state devices. Pre: (PHYS 2306, ECE 3054) or ECE 2204. (3H,3C)

3304: PHYSICAL METALLURGY
Deformation of crystalline solids and its relationship to crystal structure and crystal defects: crystal structures of metals, dislocations and plastic deformation, vacancies, recovery, recrystallization, grain growth, deformation twinning and martensite. Pre: 2034 or 2044. (3H,3C)

3314: MATERIALS LABORATORY I
Sample preparation for materials characterization techniques including various types of microscopy, spectroscopy, diffraction, and hardness testing. Instruction in the use of heat treating equipment and polishing and chemical etching procedures. Co: 3304. (3L,1C)

3424: CRYSTAL CHEMISTRY AND PHASE EQUILIBRIA
Basic crystal chemical principles in multicomponent inorganic materials. Interpretation of one, two, and three component phase diagrams. Interrelationships between crystal chemistry, phase equilibria, microstructure, and properties of materials. Pre: 2034 or 2044. (3H,3C)

3884: MATERIALS ENGINEERING PROFESSIONAL DEVELOPMENT II
Public speaking and workplace communications for materials engineers, business writing for the engineering workplace, teamwork skills, engineering ethics, collaborative writing, engineering management skills, and gender issues in the workplace. Extends the basic treatment of these topics given in MSE 2884. Pre: MSE major, junior status. Pre: 2884. (3L,1C)

4034: THERMODYNAMICS OF MATERIALS SYSTEMS
Topics in thermodynamics on the solution of materials selection and design related problems such as materials stability at high temperatures and in corrosive chemical environments. Thermodynamic principles important in controlling equilibrium in single component systems and multicomponent solid solutions and in establishing the thermodynamic driving force in kinetic processes which are important in materials processing unit operations. Estimation of thermodynamic properties and equilibrium calculations in multicomponent and multiphase systems. Pre: CHEM 1036. (3H,3C)

4055-4056: MATERIALS SELECTION AND DESIGN I AND II
4055: Selection of materials for engineering systems, based on constitutive analyses of functional requirements and material properties. 4056: The role and implications of processing on material selection. Pre: (2034 or 2044 or 3094 or AOE 3094), (ESM 2204) for 4055; 3044 for 4056. (3H,3C)

4064 (ME 4704): TRIBOLOGY
Basic principles of tribology--the study of friction, wear, and lubrication--including the importance of materials, surfaces, design, operating conditions, environment, and lubrication on friction, wear, and surface damage in any system. Application of tribological theories, concepts, techniques, and approaches to design, research, development, evaluation, and problem-solving. Pre: 2034 or 2044, 3034 or ME 3404. (3H,3C)

4075-4076: SENIOR DESIGN LABORATORY
A capstone design course centered around an open-ended, faculty-advised senior project involving the design of a process, material, or a technique for solving a technological problem. Pre: 3314 for 4075; 4075 for 4076. Co: 4085 for 4075; 4086 for 4076. (3L,1C)

4085-4086: SENIOR DESIGN RECITATION
Capstone course run in parallel with faculty-advised Senior Project Laboratory (MSE 4075-4076). Topics in engineering professional practice, project planning, and reporting. Preparation of proposals, interim reports, final project reports, and discussion of the environmental, social, and economic impacts of engineering. Instruction in design theory, ethics, continuous learning, and global issues. Senior Standing in MSE. Pre: 3884 for 4085; 4085 for 4086. Co: 4095, 4075 for 4085; 4076, 4096 for 4086. 4085: (2H,2C) 4086: (1H,1C)

4095-4096: HONORS SENIOR DESIGN LABORATORY
A capstone design course centered around an open-ended, faculty-advised senior honors project involving the design of a process, material, or a technique for solving a technological problem. Outcomes and work effort are consistent with that expected of honors students. Individual preparation and presentation of an original senior honors thesis. Enrollment in University Honors, and senior standing in MSE required. Pre: 3314 for 4095; 4095, 3324 for 4096. Co: 4085 for 4095; 4086 for 4096.
6L,2C)

4124: EXTRACTIVE PROCESSES
Principles of various industrial processes of upgrading minerals from ores, extracting metals from ores and mineral concentrates by pyrometallurgical, hydrometallurgical, and electrochemical methods; an refining metals and producing alloys by various methods. Pre: 4034 or MINE 3554. (3H,3C)

4154 (ESM 4154): NONDESTRUCTIVE EVALUATION OF MATERIALS
Concepts and methods of nondestructive evaluation of materials. Discussion of techniques and mathematical bases for methods involving mechanical, optical, thermal, and electromagnetic phenomena; design for inspectability; technique selection criteria; information processing and handling; materials response measurement and modeling; signal analysis Pre: 3054, PHYS 2176 or PHYS 2306. (3H,3C)

4164 (MINE 4164): PRINCIPLES OF MATERIALS CORROSION
Introduction to the scientific principles of materials corrosion and corrosion protection. Topics include: thermodynamics of materials corrosion, including potential- PH (Pourbaix) diagrams, kinetics of corrosion reactions and mixed potential theory, types of corrosion (uniform, galvanic, crevice, pitting, fatigue, stress corrosion cracking, intergranular, and hydrogen embrittlement), material/environmental factors that promote or prevent the various types of corrosion, and methods and techniques of corrosion testing. Co: MSE 4034 or ME 3114 or ME 3124 or ME 3134. I (3H,3C)

4234 (ECE 4234): SEMICONDUCTOR PROCESSING
Manufacturing practices used in silicon integrated circuit fabrication and the underlying scientific basis for these process technologies. Physical models are developed to explain basic fabrication steps, such as substrate growth, thermal oxidation, dopant diffusion, ion implantation, thin film deposition, etching, and lithography. The overall CMOS integrated circuit process flow is described within the context of these physical models. Pre: ECE 2204 or ECE 3054. (3H,3C) I.

4235-4236 (ECE 4235-4236): PRINCIPLES OF ELECTRONIC PACKAGING
This two-course sequence covers principles and analyses for design and manufacture of electronic packages. 4235: design issues such as electrical, electromagnetic, thermal, mechanical, and thermomechanical, are covered at the lower levels of packaging hierarchy. Materials and process selection guidelines are discussed for the manufacturing and reliability of chip carriers, multichip and hybrid modules. 4236: system-level package design issues for meeting application requirements and modeling tools for analyzing electronic packages are introduced. Materials and process selection guidelines are discussed for the manufacturing and reliability of packaged electronic products. Pre: ECE 2204. Co: ECE 3054 for 4235. (3H,3C)

4254: SCIENCE AND TECHNOLOGY OF THIN FILMS
Study of the fundamental properties and microstructure of materials in thin film (thin coating) form, their interaction with the substrate, and their processing techniques. Areas of application to exemplify the interdisciplinary nature of the field, including the electronics, biomedical, military, aerospace, and construction industries. Pre: 4206 or 4215 or 4124. Co: 3255. (3H,3C)

4304: METALS AND ALLOYS
This course covers the production, properties and uses of commercially important metals and alloys. The influence of structure, chemistry, and processing upon the properties of metals is emphasized. Alloy selection is discussed. Mechanical, electrical, thermal and chemical characteristics of ferrous and nonferrous alloys are studied. Pre: 2034 or 2044 or AOE 3094. (3H,3C)

4354: STRENGTH AND FRACTURE
Microstructural origins of strengthening, deformation, and fracture in engineering materials. Pre: 3304. Co: 3064, 3054. (1H,1C)

4414: PHYSICAL CERAMICS
Study of the relationships between the physical properties (thermal, optical, mechanical, electrical and magnetic) and the structure and composition of ceramics at the atomic and microscopic level as affected by processing and service environment. Emphasis will be placed on application and design using structural ceramics. Pre: 3314. Co: 4424. (3H,3C)

4424: MATERIALS LABORATORY II
Processing and characterization of materials; exploration of the influence of processing parameters on physical and mechanical properties. Emphasis on material synthesis. Pre: 3314. Co: 4414. (3L,1C)

4434: GLASS AND REFRACTORIES
Manufacturing processes and applications of glassy and refractory materials. Current theories of the structure of glassy and refractory materials are studied and related to their properties and behavior at high temperature and other demanding applications. Environmental effects of these energy intensive processes are taken into consideration. Pre: 3044, 3134. Co: 4414. (3H,3C)

4534 (CHEM 4634): POLYMER AND SURFACE CHEMISTRY
Physical chemical fundamentals of polymers and surfaces including adhesives and sealants. Pre: CHEM 3615 or CHEM 4615. (3H,3C) II.

4544 (CHEM 4074): LABORATORY IN POLYMER SCIENCE
Experimental techniques used in the synthesis of various linear polymers, copolymers, and crosslinked networks. Determination of polymer molecular weights and molecular weight distribution. Methods used in the thermal, mechanical, and morphological characterization of polymeric systems. Pre: CHEM 3616, CHEM 4534. (1H,3L,2C)

4554: POLYMER ENGINEERING
This course is designed to introduce the student to polymers from the MSE perspective. The basics of polymer syntheses and polymerization will be outlined. The relationship between processing, structure, and properties will be presented with respect to the performance and design requirements of typical polymer applications. Pre: 2034 or 2044, CHEM 1035, MATH 2224, PHYS 2306. (3H,3C) II.

4564: POLYMER ENGINEERING LABORATORY
Laboratory experiments exploring the processing-structure-property relationships in polymers and polymer based composites will be performed. Experiments will be conducted in synthesis, melt rheology, crystal structure and mechanical properties of polymers. Effects of reinforcement on the properties of engineering polymers will also be investigated. Co: 4554. (3L,1C)

4574 (ESM 4574): BIOMATERIALS
Lectures and problems dealing with materials used to mimic/ replace body functions. Topics include basic material types and possible functions, tissue response mechanisms, and considerations for long term usage. Integrated design issues of multicomponent materials design in prosthetic devices for hard and soft tissues are discussed. Must meet prerequisite or have graduate standing in the College of Veterinary Medicine. Pre: 3054 or ESM 3054. (3H,3C)

4584: BIOMIMETIC MATERIALS
Introduction to structure property relationships in biological materials such as wood, bone, shells, spider silk, connective tissue, blood vessels and jellyfish. Proteins and polysaccharides, biosynthesis and assembly, biomineralization, hierarchical organization. Introduction to tissue engineering and regenerative medicine. Life cycle, environmental aspects of biofabrication. Pre: CHEM 1036 or BIOL 1106 or MSE 2034 or MSE 3094 or AOE 3094. (3H,3C)

4604: COMPOSITE MATERIALS
The application of the fundamental concepts of mechanics, elasticity, and plasticity to multiphase and composite materials. Constitutive equations for the mechanical and physical properties of metal, ceramic, and polymeric matrix composites. The role of processing and microstructure on properties. Pre: (2034 or 2044 or 3094), (ESM 2204). (3H,3C)

4614: NANOMATERIALS
Synthesis of 0-dimensional nanoparticles, 1-dimensional nanotubes, nanowires, and nanorods; 2-dimensional nanoribbons and nanofilms, and specialized nano-features on substrates. Characterization of nanomaterials. Processing into higher order dimensions. Chemical, physical, mechanical, and electrical properties of nanomaterials. Application of nanomaterials. Pre: 4034. (3H,3C)

4624: DESIGN OF MATERIALS
The design of materials through the application of microstructural based structure/property relationships. Emphasis on the use of phenomenological and theoretical structure-property-processing relationships as a means to guide material design. The influence of scale (nano, micro, meso, macro) on property development and material behavior. Co: 4055 or permission of Instructor. Co: 4055. (3H,3C)

4634: DESIGN WITH MATERIALS
The role and implications of material properties, processing, and structure in engineering and/or functional design. The role of material selection in the conceptualization, specification, and implementation phases of the design process. Case studies in state-of-the-art, material-limiting component design. Multidisciplinary enrollment encouraged. Co: senior capstone experience or permission of the instructor. (3H,3C)

4644: MATERIALS OPTIMIZATION THROUGH DESIGNED EXPERIMENTS
Methods of analysis of variation in materials systems, manufacturing or R&D through the use of statistical methods including experimental design techniques. Instructional examples related to Materials Science and Engineering. Pre: ENGR 2034, ENGR 2044, ENGR 3094 or AOE 3094. (3H,3C)

4900: COMMUNICATIONS PORTFOLIO IN MATERIALS SCIENCE AND ENGINEERING
Each student develops a portfolio of writing and speaking in various styles from work performed in seven required courses, and reflects on the development of his or her communication ability over the course of the program. The completed portfolio and reflections documents the student's success in meeting the Area 1: Writing and Discourse in written, oral, and visual communication. Students register for this course in the semester during which their portfolio will be completed. Pass/Fail only. Pre: 3314, 3884, 4424. Co: 4086. (1H,1C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Engineering

Mechanical Engineering

www.me.vt.edu

Kenneth S. Ball, Head and L.S. Randolph Professor
George R. Goodson Professor: D.J. Inman
John R. Jones III Professor: Ranga Pitchumani
Roanoke Electric Steel Professor: C.R. Fuller
W. Martin Johnson Professor: A.J. Kurdila
Chris Kraft Professor of Engineering: W. F. Ng
J. Bernard Jones Professor: W.F. O'Brien
Professors: M. Ahmadian; K.S. Ball; R.C. Benson; E.F. Brown; R.A. Burdisso; T.E. Diller; S.M. Duma; C.R. Fuller; D.J. Inman; J.M. Kennedy; R.G. Kirk; A.J. Kurdila; D.J. Leo;
R.L. Mahajan; D.J. Nelson; W.F. Ng; W.F. O'Brien; R. Pitchumani; D. Tafti; J. Terpenny;
U. Vandsburger; M.R. von Spakovsky
Associate Professors: J. Bayandor; F. Battaglia; J.H. Bohn; C.L. Dancey; S. Ekkad; M.W. Ellis; M.E.F. Kasarda; T. Furukawa; J.B. Ferris; H.C. Gabler; W. Hardy; D.W. Hong;
M.E. Johnson; A.A. Kornhauser; B. Lattimer; R. Mueller; M.R. Paul; S. Priya; M.J. Roan;
C. Sandu; S.C. Southward; S. Taheri; B. Vick; P.P. Vlachos; R.L. West; A.L. Wicks
Assistant Professors: J. Abiade; B. Behkam; N.C. Goulbourne; S. Huxtable; A. Leonessa; C.G. Rylander; N. Rylander; C. Williams
Research Associate Professors: K. Kochersberger; M.A. Pierson
Professors Emeritus: L.J. Arp; R.A. Comparin; N.S. Eiss; M. Furey; R.E. Hedgepeth; C.J. Hurst; J.B. Jones; R.G. Leonard; J. R. Mahan; W.H. Mashburn; L.D. Mitchell; R. Mitchiner; J. Moore; A. Myklebust; T.F. Parkinson; F.J. Pierce; H.H. Robertshaw; A.G. Szeless; J.R. Thomas; W.C. Thomas; R.J. Whitelaw
Adjunct Professors: R. Anderl (TU Darmstadt); P.G. Brolinson (Edward Via College of Osteopathic Medicine); D. Carlson (Lord Corp.); J. Funk (Biodynamic Research Corp.); M.J. Hampe (TU Darmstadt); T. Kress (BEST Engineering); D. Rabe (Air Force Research Lab); B. Sanders (Air Force Research Lab)

Nature of the Profession

Mechanical engineering is the broadest of the engineering professions. Because of the breadth of the ME discipline, mechanical engineers work in a wide variety of technical areas and are employed in a range of job functions. Specialty areas within the mechanical engineering discipline include, among many others, acoustics, biomechanics, CAD, controls, energy conversion and energy management, HVAC, materials, mechanical design, mechatronics, nuclear engineering, robotics and automation, and turbomachinery. The actual job functions which mechanical engineers perform vary widely as well. ME's work in design, research and development, manufacturing, service and maintenance, as well as technical sales, in almost every industry. Many are in management and administration. Many mechanical engineering graduates go on to more advanced degrees, or continue their education in other fields, such a law or business.

Employment Opportunities

Because of the diversity and breadth of the mechanical engineering profession, ME graduates find employment in a wide variety of

industries, laboratories, and consulting firms. This results in a very stable job market that is not dependent upon a single particular industry. The textile, petroleum, chemical, electronic, automotive, aerospace, power generation, HVAC, and manufacturing industries hire relatively large numbers of mechanical engineering graduates and the starting salaries for ME's are very competitive with the other engineering disciplines

Because of the wide diversity of specialties and job functions any two mechanical engineers might have significantly different day-to-day activities and responsibilities. Some may be concerned with very large engineering systems while others are working with small and even microscale devices and components; some work might call for highly analytical or mathematical approaches while other work might be more amenable to experimental or empirical approaches. Mechanical engineers may be involved in the operation of processing plants, or the design of engines, prosthetic devices, steam and gas turbines or compressors and pumps, alternative fuel devices, and many other devices and systems. At Virginia Tech there is a close association between the ME departments research and design project activities with industry. This enhances the opportunities for student interaction with industry representatives.

Mechanical Engineering Program Educational Objectives

The ME program produces graduates who utilize the following attributes in their professional careers to attain the indicated achievements:

1. fundamental technical knowledge and skills in mathematics, science, and engineering to recognize, analyze and solve problems, and to apply these abilities to the generation of new knowledge, ideas or products in industry or government; and to implement these solutions in practice.
2. practical experience to work well in local and international team environments and to become effective written and oral communicators, both for communicating ideas to other people, mentoring, and for learning from others.
3. recognition of the importance of and engagement in life-long learning, whether through self-study, continuing education courses or workshops, or through formal graduate level education, and encourage others to have this same motivation.
4. understanding of ethical responsibility and service toward their peers, employers, and society and follow these precepts in their daily lives.

Program Outcomes

We expect our students to have the following skills, knowledge, and behaviors by the time of their graduation. We want our students to attain:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multi-disciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
  the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The Department of Mechanical Engineering at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700. One important objective of the Department of Mechanical Engineering is to ensure that every mechanical engineering graduate has the knowledge, ability, and understanding required to meet the basic ABET guidelines. The structure and sequence of courses is designed to provide these requirements for every graduate. The department is committed to providing students with an exceptional experience in both the theory and practice of mechanical engineering. In the senior capstone sequence, students are required to apply classroom knowledge to complex engineering problems requiring teamwork, problem formulation, economic analysis, effective communication, and product realization. These projects are carefully selected and updated to ensure relevancy to contemporary technical issues and needs. The department encourages the involvement of underclass students and students outside the department and college in these projects. The department also encourages hands-on student involvement by providing dedicated machine and welding shops that exclusively serve the undergraduate program. The required sophomore-level Manufacturing Processes Laboratory course and certification by a professional machinist are required prior to use of either of these shops. Opportunity for professional development is provided by participation in student professional organizations, such as the American Society of Mechanical Engineers, ASME, and the American Nuclear Society, ANS.

The Curriculum

A total of 130 semester credits are required for graduation.

The curriculum provides a strong foundation in the basic physical and chemical sciences and in mathematics. These are followed by a sequence of courses that provide a broad background in design methodology, computer programming, electronics, solid and fluid

mechanics, manufacturing processes, system modeling, machine design, thermodynamics, heat and mass transfer, statistics and materials. Courses in English and in the humanities and social sciences are included to broaden the individual. This background is strengthened and unified through a sequence of engineering design and laboratory courses. Instructional laboratories in the junior and senior years provide opportunities for students to learn measurement and instrumentation techniques. Students apply these skills to the acquisition and analysis of data from various engineering systems.

In all professional endeavors the mechanical engineer must consider ecological effects as well as the economic and social needs of people. The mechanical engineer must consider the conservation of natural resources and the environmental impact in the design of systems. These considerations are included in a number of ME courses and technical elective classes. Students wishing to further strengthen this area may wish to consider the Green Engineering Option at http://www.eng.vt.edu/green/index.php.

The unifying activity in all aspects of mechanical engineering is the design function. A special emphasis has been placed on the use of computer-aided design methods and applied design project experience as a required part of the curriculum. Elective courses in the junior and senior years provide students with the opportunity to pursue specialized interests related to career plans or preparation for graduate study.

The department participates in the Cooperative Education Program in which qualified students may alternate semesters of study with semesters of professional employment. Approximately twenty-five percent of all mechanical engineering students participate in this program.

To prepare its students to function as true global engineers, the department offers in collaboration with its sister department at the Technische Universität Darmstadt, Germany, the students the opportunity to complete their senior year at the other university and thus earn a BSME degree simultaneously from both univerisities.

The Department of Mechanical Engineering actively seeks input on the nature and quality of our program from all interested individuals and organizations, including students, employers and supporting agencies. Our goal is to provide the best possible service to the students who entrust their education to us. Through our continuous improvement efforts, we pledge to continually improve the content of our curriculum, our educational methods and our facilities. Comments to the department head or any member of the faculty are welcomed. Note that, because of this continuous improvement process, degree requirements and course content are subject to periodic change. Please consult the department academic advisor for current information.

Entrance Requirement

Mechanical Engineering is a restricted major. Students must have a 2.5 or better GPA and complete the required freshman year college of engineering courses to gain admission.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), and toward the degree in mechanical engineering.

Satisfactory progress toward a B.S. in Mechanical Engineering includes the following minimum criteria:

1. A minimum overall GPA, of 2.5
2. An in-major GPA of at least a 2.0 (includes all courses with a « ME » prefix in the course number).

The department offers graduate programs leading to the M.S., M.Eng., and Ph.D. in mechanical engineering (see the Graduate Catalog).

	Semester	
First Year	**I**	**II**
ENGE 1024: Engineering Exploration	**2**	
ENGE 1114: Engineering Exploration of Design		**2**
ENGL 1105: Freshman English	**3**	
ENGL 1106: Freshman English		**3**
CHEM 1035: General Chemistry	**3**	
CHEM 1045: Chemistry Lab	**1**	
MATH 1205: Calculus	**3**	
MATH 1206: Calculus		**3**
MATH 1114: Elementary Linear Algebra	**2**	
MATH 1224: Vector Geometry		**2**

PHYS 2305: Foundations of Physics		4
Curriculum for Liberal Education Area 6/2	1	3
Total Required Credits (32 Credit Hours)	**15**	**17**
Second Year	**I**	**II**
ECE 3054: Electrical Theory		3
ENGE 2314: Engineering Problem Solving with C++	2	
ESM 2104, 2204: Statics, Deformable Bodies	3	3
ESM 2304: Dynamics		3
ISE 2214: Manufacturing Processes	1	
MATH 2224, 2214: Multivar. Calculus, Diff. Eq.	3	3
ME 2024: Intro to ME Design	3	
ME 2124: Intro to Thermal Fluid Sciences		2
STAT 3704: Engineering Statistics		2
PHYS 2306: Foundations of Physics & Lab II	4	
Total Required Credits (32 Credit Hours)	**16**	**16**
Third Year	**I**	**II**
ECE 3254: Industrial Electronics	3	
ME 3514: System Dynamics	3	
ME 3124: Thermodynamics	3	
ME 3304: Heat Transfer		3
ME 3404: Fluid Mechanics	3	
ME 3504 or 4504: Vibrations or Controls		3
ME 3614: Mechanical Design	3	
ME 4005: ME Lab I		3
MSE 2034: Elements of Materials Science		3
Curriculum for Liberal Education Area 2/3	3	
Technical Elective		3
Total Required Credits (33 Credit Hours)	**18**	**15**
Fourth Year	**I**	**II**
ME 4015, 4016: Capstone Design Course (Writing Intensive)	3	3
ME 4006: ME Lab II (Writing Intensive)	3	
ME 4124 CAD of Fluid-Thermal Systems	3	
Technical Electives	3	3
Technical Electives	3	3
Curriculum for Liberal Education Area 2/3	3	3
Area 7: Critical Issues in a Global Context		3
Total Required Credits (33 Credit Hours)	**18**	**15**
A total of 130 semester credits are required for graduation.		

Notes:

- There are no hidden prerequisites.
- **Foreign Language Requirement:** Students who did not complete 2 units of a foreign language in high school must earn 6 credit hours of college level foreign language. These credits are in addition to those normally taken for graduation.

VT-TUD Dual BSME Degree Program

Standard program for students that complete their first three years at Virginia Tech and their senior year at the Technische Universität Darmstadt, Germany:

First and Second Year (Virginia Tech)	I	II
First year: Same as for regular VT BSME degree program	15	17
Second year: Same as for regular VT BSME degree program	16	16
Total Required Credits (64 Credit Hours)	31	33

Third Year and Summer (Virginia Tech)	I	II	III	IV
ECE 3254: Industrial Electronics	3			
ME 3514: System Dynamics	3			
ME 3124: Thermodynamics	3			
ME 3304: Heat & Mass Transfer		3		
ME 3404: Fluid Mechanics	3			
ME 3614: Mechanical Design I	3	3		
ME 4005: Mechanical Engineering Laboratory I		3		
MSE 2034: Elements of Materials Engineering	3	6		
Curriculum for Liberal Education Area 2 & 7			(6)	
Curriculum for Liberal Education Area 3				6
GER 1114: Accelerated Elementary German				
GER 2114: Accelerated Intermediate German				
Total Required Credits (39 Credit Hours)	18	15		6

Fourth Year (Technische Universität Darmstadt)	Sep	WS	SS
German as a Second Language (Course 4) Level B2/C1, Oberkurs, UNIcert III	X		
Strukturdynamik		3	
Systemtheorie und Regelungstechnik		3	
Fluids Engineering Laboratory		2	
Aerodynamik I (3 cr) or Grundlagen der Flugantriebe (4 cr)		3-4	
Technical Electives		3-2	
Bachelor-Thesis			6
Numerische Mathematik			2
Numerische Berechnungsverfahren			2
Grundlagen der Turbomaschinen und Fluidsysteme			4
Total Required Credits (28 Credit Hours)		14	14

The German language courses are only required for those students that do not possess sufficient German language skills: The lectures and exams at Technische Universität Darmstadt (TUD) are in German. The Bachelor Thesis may be written in English. The students must pass the UNIcert Level III exam at TUD in order to enroll in TUD engineering courses.

GER 1114 is equivalent to GER 1105-1106 and satisfies the VT foreign language requirement. GER 2114 is equivalent to GER 2105-2106 and counts in this context as technical elective (2credit hours) and free elective (3 credit hours). Students must earn a “B+” or better in GER 2106 or 2114 to continue at TUD. Students that do not take GER 2105, 2106, 2114, or at least 4 CP ECTS German language courses at TUD as a VT technical elective will need to complete an additional 2 credit hours of technical electives.

TUD requires at least 60 CP ECTS be completed at TUD. The VT BSME degree program requires at least 130 semester credits for graduation.

TUD-VT Dual BSME Degree Program

Standard program for students that complete their first two years at Technische Universität Darmstadt, Germany and their senior year and summer at Virginia Tech:

First and Second Year (Technische Universität Darmstadt)	
General Chemistry Lab	Naturwissenschaften III
Arbeitstechniken	Maschinenelemente und Mechatronik I
Einführung in den Maschinenbau	Mathematik III für Maschinenbauer
Grundlagen der Datenverarbeitung	Technische Mechanik III (Dynamik)
Mathematik I für Maschinenbauer	Technische Thermodynamik I
Naturwissenschaften I	Werkstoff- und Bauteilfestigkeit
Technische Mechanik I (Statik)	Technische Strömungslehre
Technologie der Fertigungsverfahren	Maschinenelemente und Mechatronik II
Einführung in das rechnergestützte Konstruieren	Numerische Mathematik
Einführung in die Elektrotechnik	Physikalisches Grundpraktikum für Maschinenbauer
Naturwissenschaften II	Product Design Project
Mathematik II für Maschinenbauer	Technische Thermodynamik II
Technische Mechanik II (Elastostatik)	Messtechnik für Maschinenbauer
Werkstoffkunde und -prüfung	

Total Required Credits (81 Credit Hours)

Third Year and Summer (Virginia Tech)	I	II	III	IV
AOE 4404 or 4024: Applied Numerical Methods or Intro FM		3		
ENGL 1105, 1106: Freshman English I & II	3	3		
ME 3304: Heat and Mass Transfer		3		
ME 3504: Dynamic Systems – Vibrations		3		
ME 4006: Mechanical Engineering Laboratory II	3			
ME 4015, 4016: Engineering Design and Project I & II	3	3		
ME 4124: Fluid Machinery – Heat Transfer Design	3			
ME 4504: Dynamic Systems – Controls	3		3	3
Curriculum for Liberal Education Area 2				3
Curriculum for Liberal Education Area 3	3			
Curriculum for Liberal Education Area 6		1	3	
Curriculum for Liberal Education Area 7				
Technical Electives		3		
Total Required Credits (49 Credit Hours)	18	19	6	6

The VT BSME degree program requires at least 130 semester credits for graduation.

Undergraduate Courses (ME)

2004 (MATH 2004): ENGINEERING ANALYSIS USING NUMERICAL METHODS
Numerical methods applied to engineering analysis. Linear systems. Root finding. Numerical integration. Ordinary differential equations. Programming using a software package such as Matlab. Pre: ENGE 1016, MATH 1206, MATH 1114. (2H,2C)

2024: INTRODUCTION TO ENGINEERING DESIGN AND ECONOMICS
Design process, mini-design projects, collaborative design, product dissection, economics of decision making, reverse engineering, intellectual property, oral, written, and graphic communications, engineering ethics. Pre: ENGE 1016 or ENGE 1114. Co: ESM 2104, PHYS 2306. (3H,3C) I,II.

2124: INTRODUCTION TO THERMAL AND FLUID ENGINEERING
Basics of thermodynamics, fluid mechanics, and heat transfer. Fluid and thermal properties of materials. Ideal gas equation of state. First law of thermodynamics in closed systems. Transient heat transfer. First law of thermodynamics in open systems. Fluid mechanics balances, open systems. Emphasis on applications in all topic areas. Pre: ESM 2104. Co: MATH 2214. (2H,2C) I,II,III.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3114: ENGINEERING THERMODYNAMICS
General treatment of the basic laws of thermodynamics with emphasis on engineering applications. This course is for curricula not requiring 3124. I Pre: MATH 2214. (3H,3C)

3124: THERMODYNAMICS
Classical thermodynamics and its applications. Thermodynamic properties of pure substances: property tables, property software, equations of state. First law of thermodynamics. Second law of thermodynamics. Gas mixtures. Combustion: atom and energy balances. Power and refrigeration cycles. Pre: 2124, (MATH 2214 or MATH 2214H). (3H,3C) I,II.

3134: FUNDAMENTALS OF THERMODYNAMICS
Fundamental concepts, first and second laws, gas and vapor processes with emphasis on chemical reactions, statistical interpretation of entropy, limited use of thermodynamic property tables. This course is for AOE and ESM students. Pre: MATH 2214 or MATH 2214H. (3H,3C)

3145-3146: FUNDAMENTALS OF NUCLEAR ENGINEERING
Application of fundamental principles of neutron physics and reactor theory. Introduction to nuclear cross-section data, neutron scattering, nuclear fission, and diffusion theory. Examination of current and next generation nuclear power plants. Co: MATH 2214 for 3145. (3H,3C)

3304: HEAT AND MASS TRANSFER
Comprehensive basic course in heat and mass transfer for mechanical engineering students. Principles of conduction, convection, and radiation with applications to heat exchangers and other engineering systems. Pre: 2124, (MATH 2214 or MATH 2214H). (3H,3C) II,IV.

3404: FLUID MECHANICS
Comprehensive first course in basic and applied fluid mechanics. Fluid properties, statics, kinematics, and dynamics. Euler's and Bernoulli's equations. Hydrodynamics. Dimensional analysis and similitude. Real fluids, laminar and turbulent flows. Boundary layer model and approximate

analysis. Compressible flow and propulsion devices. Flow measurement. Introduction to turbomachinery with applications. Pre: 2124, (MATH 2214 or MATH 2214H). (3H,3C) I,II.

3504: DYNAMIC SYSTEMS - VIBRATIONS
Principles of dynamic system modeling with emphasis on second order mechanical systems. Harmonic and nonharmonic vibrations of single and multi-degree of freedom systems. Applications of computer simulation and analysis techniques in vibrations. Pre: (MATH 2214 or MATH 2214H), ME 3514. (3H,3C) II,III.

3514: SYSTEM DYNAMICS
Mathematical descriptions of physical systems' behavior including mechanical, electrical, thermal, and fluid systems and their combinations; system descriptions using state variable and transfer functions; analysis of system responses: convolution integral, frequency response, numerical simulations, and Laplace transform methods; systems concepts: input-output, causality, and analogies; general process descriptions including first-order, second-order, and time delayed. Pre: ESM 2304. (3H,3C) I,II.

3604: KINEMATICS AND DYNAMICS OF MACHINERY
Kinematic analysis and design of cams, gears, and linkages, velocity, acceleration and force analysis, kinematic synthesis, balancing, kinematic and force analysis by complex numbers, computer-aided analysis, and synthesis of linkages. Pre: ESM 2304. (3H,3C)

3614: MECHANICAL DESIGN I
Design of mechanical components subject to static and fatigue loads. Design using screws, fasteners, springs and bearings. Computer-aided design using transfer matrix and finite element methods. Pre: ESM 2204, (MATH 2214 or MATH 2214H). (3H,3C) I,II.

4005-4006: MECHANICAL ENGINEERING LAB
Principles of measurement, measurement standards and accuracy, detectors and transducers, digital data acquisition principles, signal conditioning systems and readout devices statistical concepts in measurement, experimental investigation of engineering systems, technical report writing. Pre: ECE 3254, ME 3514, STAT 3704 for 4005; 4005 for 4006. (2H,3L,3C) 4005: II,IV; 4006:

4015-4016: ENGINEERING DESIGN AND PROJECT
Team oriented, open-ended, multi-disciplinary design projects focused on industrially relevant problems. A specific, complex engineering design problem is normally taken from problem definition to product realization and testing. Emphasis is placed on documenting and reporting technical work, idea generation and selection, application of design and analysis tools developed in previous courses, project management, selling technical ideas and working in teams. I Pre: (4005, 3614, 3304), (3504 or 4504) for 4015; 4015 for 4016. 4015: (2H,1L,3C) 4016: (3H,3C)

4124: COMPUTER AIDED DESIGN OF FLUID-THERMAL SYSTEMS
Review of physical laws and engineering concepts introduced in thermodynamics, fluid mechanics, and heat transfer with applications. Emphasis on analysis, modeling, and design of engineering systems, components and physical phenomena with state-of-the-art computer software. Pre: 3124, 3304, 3404. (2H,3L,3C)

4134: AIR CONDITIONING
Analysis and design practice for heating, ventilation, and air-conditioning (HVAC) systems. Psychometrics, air quality, space heating and cooling loads, and moisture control in buildings. Configurations and designs for HVAC systems by conventional practice and computer-aided methods. Liquid- and air-based distribution systems. Selection of HVAC system components including compressors, evaporators, heat pumps, and controls for comfort cooling. Pre: 3304. (3H,3C)

4144: REFRIGERATION AND CRYOGENIC ENGINEERING
Thermodynamics of refrigeration cycles and characteristics of refrigeration equipment. Analysis and design of systems for cold storage, freeze drying, and manufacturing processes. Engineering problems associated with reduction, handling, and storage of cryogenic fluids including liquefied natural gas. Low temperature properties of engineering materials. Pre: 3304. (3H,3C)

4154: INDUSTRIAL ENERGY MANAGEMENT
Comprehensive study of managing energy resources and usage in an industrial plant. Four areas of energy management are covered: how to organize an energy management program in an industrial plant; techniques for conducting industrial energy surveys; how to make energy systems more efficient; and the design and analysis of energy systems. Pre: 3114 or 3124. (3H,3C)

4174 (AOE 4174): SPACECRAFT PROPULSION
Spacecraft propulsion systems and their applications in orbital, interplanetary, and interstellar flight. Rocket propulsion fundamentals; advanced mission analysis; physics and engineering of chemical rockets, electrical thrusters, and propellantless systems (tethers and sails); spacecraft integration issues. Pre: 4234 or AOE 4234. (3H,3C)

4204: INTERNAL COMBUSTION ENGINES
Analysis and design of gasoline and diesel engines. Fundamental processes and their application in current technology. Thermodynamics: air standard and air-fuel cycles. Combustion: stoichiometry, fuels, chemical equilibrium, chemical kinetics, flame propagation, knock, pollutant formation and control. Flow processes: volumetric efficiency, intake and exhaust tuning, two-stroke scavenging, carburetion, fuel injection, super- and turbo-charging. Pre: 3124, 3404. (3H,3C)

4214: POWER GENERATION
The design, control, and performance characteristics of electric power generating plants, with major emphasis upon the steam generating system, both fossil and nuclear. Pre: 3124, 3304. Co: 4414. (3H,3C)

4224: AIRCRAFT ENGINES AND GAS TURBINES
Performance and characteristics of aircraft engines and industrial gas turbines, as determined by thermodynamic, fluid mechanic, heat transfer, and

solid mechanic behavior of components. Operational limitations and component matching. Stress and associated temperature limits and influence of blade cooling techniques on turbines. Pre: 4234 or 4124. (3H,3C)

4234 (AOE 4234): AEROSPACE PROPULSION SYSTEMS
Design principles and performance analysis of atmospheric and space propulsion engines and systems. Application of thermodynamics, compressible fluid flow and combustion fundamentals to the design of gas turbine and rocket engines and components, including inlets, turbomachines, combustors, and nozzles. Matching of propulsion system to vehicle requirements. Must have a C- or better in pre-requisites ME 3404 and ME 3124 or AOE 3114 and AOE 3134. Pre: (3404, 3124) or (AOE 3114, ME 3134). (3H,3C)

4244 (AOE 4244): MARINE ENGINEERING
Analysis of major ship propulsion devices (propellers, water jets). Integration with propulsion plant and machinery. Characteristics of marine steam turbines, nuclear power plants, marine diesels, and marine gas turbines. Shafting system, bearings, and vibration problems. Must have a C- or better in pre-requisites AOE 3204 and ME 3124 or ME 3134. Pre: AOE 3204, (AOE 3134 or AOE 3124). (3H,3C)

4254: RAMJET AND ROCKET PROPULSION
Detailed study of analysis and design of ramjet and rocket propulsion systems. Vehicle performance requirements relating to choice of propulsion systems. Ramjet inlets, combustion chambers, and nozzles; analysis techniques for high-speed flow. Liquid and solid propellant rocket engine designs. Solid propellant burning rates, grain design. Special propulsion systems for high speed, trans-atmospheric, and space flight. Pre: 4234. (3H,3C)

4304: HEAT TRANSFER ANALYSIS
Methods for solving multidimensional and transient conduction problems. Convective heat and mass transfer with applications to industrial process heating, heat exchanger design, boiling and condensation, cooling tower design, and aerodynamic heating. Radiation properties of materials and heat transfer applications to real surfaces and absorbing-transmitting media including gases and windows. Transfer from wetted surfaces and through porous media with applications to drying, evaporative cooling, and heat pipe theory. Pre: 3304. (3H,3C)

4404: FLUID MECHANICS II
Integral and differential equations of mass, momentum, and energy. Equations for turbulent flow. Applications in hydrodynamics, thermodynamics of compressible flow, channel and multiple path systems, boundary layers with exact and approximate solutions, shear and drag, fluid transients, laboratory techniques. Pre: 3404. (3H,3C)

4424: THERMODYNAMICS OF FLUID FLOW
One-dimensional compressible flow of perfect gases under specialized conditions: isentropic flow (with area change), normal and oblique shocks, constant area flow with friction, constant area flow with heat transfer, Prandtl-Meyer flow, and generalized one-dimensional flow. Introduction to propulsion systems and other selected topics. Pre: (3124 or 3114), 3404. (3H,3C)

4434 (BSE 4424): FLUID POWER SYSTEMS AND CONTROLS
Design and analysis of industrial and mobile hydraulic systems. Hydrostatic transmissions. Electrohydraulic servovalve characteristics and use in precise position and speed control application. Characteristics of pumps, motors, valves, and activators illustrated in laboratory exercises. Pre: ESM 3024 or ME 3404. (2H,3L,3C)

4444: ROTATING MACHINERY
Techniques and analysis issues associated with the dynamics, operation, and maintenance of rotating machinery with a focus on turbomachinery issues. Vibration analysis, introductory rotor dynamics, rotor balancing techniques, oil and wear particle sampling, gearbox and bearing issues, industrial case studies, and environmental issues associated with power plant operation. Hands-on experience with small high speed rotors and state-of-the-art monitoring instrumentation in common use throughout the petrochemical and power generation industries. Monitoring of actual steam plant equipment. Pre: 3504. (3H,3C)

4504: DYNAMIC SYSTEMS - CONTROLS ENGINEERING I
Fundamentals of feedback control theory, classical analysis and design techniques for automatic controls, introduction to modern control theory. Pre: 3514. (3H,3C) I,II.

4514: CONTROLS ENGINEERING II
Applications of classical and modern control techniques in design studies. Introduction to nonlinear systems and nonlinear control strategies and to digital control techniques. Includes design problems and case studies with hands-on experience. Pre: 4504. (3H,3C)

4524: INTRODUCTION TO ROBOTICS AND AUTOMATION
Automation, robot technology, kinematics, dynamics, trajectory planning, and control of two-dimensional and spatial robots; robot programming; design and simulation of robotic devices. Pre: ECE 2574, STAT 4714. (3H,3C)

4534: LAND VEHICLE DYNAMICS
Analytical methods for land vehicle dynamics. Mechanics of pneumatic tires on pavement and steel wheels on rails. Vehicle stability, handling, response to random guideway and roadway irregularities, ride quality computation methods and standards, suspension design. Pre: 3514. (3H,3C)

4544: AUTOMOTIVE ENGINEERING
Vehicle performance, drive train, suspension, steering, and brake systems. Steady state and transient conditions. Senior standing in Mechanical Engineering required. (3H,3C)

4554: ADVANCED TECHNOLOGY FOR MOTOR VEHICLES
Energy use and environmental issues for motor vehicles: Emissions standards, fleet requirements, dynamometer testing, fuel economy, and vehicle performance. Alternative fuel vehicles: Characteristics and infrastructure of fuels, batteries, electric vehicles, and hybrid electric vehicles. Vehicle

design: Modeling and simulation of vehicle energy use and performance, component sizing. Fuel cells for transportation. Heavy-duty vehicles and busses. Low mass vehicles and future vehicle technology. Pre: 3114 or 3124 or 3134. (3H,3C)

4604: MECHANISMS
Advanced cam design using analytical and computer methods, design of nonstandard spur-gears cut with a hob and with a pinion-shaper cutter; introduction to computer methods in the design of spur gears; kinematic synthesis by graphical, analytical, and computer methods; balancing of rotating and reciprocating masses, balancing of linkages. Pre: 3604. (3H,3C)

4614: MECHANICAL DESIGN II
Design of mechanical elements such as welded joints hydrodynamic bearings, spur gears, shafts, brakes. Alternative fatigue design methods, cumulative fatigue, mechanical design computer software. Pre: 3614. (3H,3C)

4624: FINITE ELEMENT PRACTICE IN MECHANICAL DESIGN
Application of the finite element method to stress analysis problems in mechanical design. Modeling techniques, proper use of existing computer programs, interpreting of results, application to design modification. Pre: 3614. (3H,3C)

4634: INTRODUCTION TO COMPUTER-AIDED DESIGN AND MANUFACTURING
Participants will study the computer-aided design and manufacturing of mechanical systems. A mechanical system will be designed including preliminary design, analysis, detail design, numerical control programming, and documentation. Applications programs will be written and interfaced to the CAD/CAM database. All assignments will be carried out on a CAD/CAM system. (2H,3L,3C)

4644: INTRODUCTION TO RAPID PROTOTYPING
Participants will study topics fundamental to rapid prototyping and automated fabrication, including the generation of suitable CAD models, current rapid prototyping fabrication technologies, their underlying material science, the use of secondary processing, and the impact of these technologies on society. The rapid prototyping process will be illustrated by the actual design and fabrication of a part. Programming skills required.
Co: 4634. (3H,3C)

4664: INTRO GLOBAL COLL ENGR DESIGN
Participants will study topics fundamental to global collaborative engineering design, product data management, and collaborative product data management. These topics will be applied during a team project with team members located overseas, utilizing state-of-the-art collaborative engineering and product data management software and hardware technologies. Partially duplicates 5664. Credit may only be received for one course. Pre: 2024, 4634. (3H,3C)

4704 (MSE 4064): TRIBOLOGY
Basic principles of tribology--the study of friction, wear, and lubrication--including the importance of materials, surfaces, design, operating conditions, environment, and lubrication on friction, wear, and surface damage in any system. Application of tribological theories, concepts, techniques, and approaches to design, research, development, evaluation, and problem-solving. Pre: MSE 2034 or MSE 2044, MSE 3034 or ME 3404. (3H,3C)

4714: THEORY AND APPLICATION OF HYDRODYNAMIC LUBRICATION
Basic equation of lubrication as applied to design problems. Reynolds equation, plain journal bearing analysis, fixed arc geometry bearing analysis, tilting pad bearing analysis. Fluid film seal analysis and design. Thrust bearing design and application. Introduction to gas bearing theory. Finite element solution for fluid film bearing analysis. Pre: 3404. (3H,3C)

4724: ENGINEERING ACOUSTICS
Basic acoustical theory and practice, acoustic terminology, measurement, transmission, and perception of sound, muffler design, noise control techniques. Pre: 3404, 3124. (3H,3C)

4734 (ECE 4734): MECHATRONICS
Electromechanical system modeling, control and applications. Design of electronic interfaces and controllers for mechanical devices. Sensor technology, signal acquisition, filtering, and conditioning. Microcontroller-based closed-loop control and device communications. Sensor and actuator selection, installation, and application strategies. I Pre: ECE 2504, ECE 2704 or ME 3514. (3H,3C)

4744: THE COMPLEXITY OF SOCIO-TECHNOLOGICAL PROBLEMS
Examines the complexity and interconnectedness of problems involving technology and society (environmental pollution, waste of natural resources, energy, automation, computers and privacy, medical technology, genetic engineering, hunger, the third world, military spending, nuclear arms and war, etc.). Includes readings, guest lectures, discussion, and project work in small groups on real problems. Junior or Senior standing in any field required. (3H,3C)

4754: IMPACT BIOMECHANICS
Introduction to impact biomechanics. Covers in-depth background of human tolerance to impact loading. Emphasis on the interdisciplinary nature of impact biomechanics. Use of fundamental engineering principles and advanced medical technologies to develop injury prevention measures. Real world examples from automobile safety, military applications, and sport biomechanics. Pre: ESM 2204, ESM 2304. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

College of Engineering

Mining & Minerals Engineering

www.mining.vt.edu

G.T. Adel, Head
Stonie Barker Professor: M. E. Karmis
Nicholas T. Camicia Professor: R. H. Yoon
Massey Professor: G. H. Luttrell
Professor: G. T. Adel
Associate Professors: M. G. Karfakis; E. Westman
Assistant Professor: K. Luxbacher
Adjunct Professor: J.A. Herbst

Overview

The Department of Mining and Minerals Engineering offers an engineering program containing aspects of mineral science, engineering, and technology that is professionally related to the minerals industry. Graduates of this program find domestic and international employment opportunities with hardrock, coal, industrial minerals, and construction aggregates producers, as well as with government agencies and equipment vendors.

The mission of the department is to produce high quality, rigorously trained mining engineers, whose background and education reflect the current level of technology and thought of the profession, and who can enter directly into engineering practice or, alternatively, graduate school for further study. Specifically, the Department of Mining and Minerals Engineering seeks, as its educational objectives, to prepare graduates:

- to solve engineering problems using the fundamental principles of science, mathematics, and engineering, in conjunction with state-of-the-art tools;
- to function in a professional and ethical manner, and understand the social, environmental, regulatory, and safety considerations of the mining profession;
- to be effective communicators, leaders, and team members;
- to understand the practical aspects of the mining industry and possess an appreciation for mining as a business; and
- to engage in life-long learning and professional development.

The mining engineering curriculum utilizes the basic and engineering sciences to develop the various areas of activity of the mining engineer: mineral exploration, evaluation, development, extraction, mineral processing, conservation, protection of the environment, and mineral economics. Course work in these areas provides a unique background for engineering and management positions in industry and government, as well as for continuation of specialized graduate studies.

Intrinsic to the curriculum is the development of a meaningful, major engineering design experience that builds upon the fundamental concepts of mathematics, basic sciences, the humanities and social sciences, engineering topics, and communication skills. This design experience is stressed within the major and grows with the development and progression of the student. Ethical, social, safety, economic, and environmental considerations are emphasized in the design experience throughout many courses, including the capstone senior design course. Finally, the major engineering design experience is a focal point of the mining engineering curriculum and is consistent with the objectives and goals of the program.

The program has an emphasis on the application of computers to mining and minerals processing operations. Furthermore, it exposes students to laboratory courses which focus on conducting experiments, understanding the principles involved in each experiment, and analyzing and interpreting experimental data.

Information on the mission, goals, and curriculum of the program is continuously updated on the departmental website.

The Cooperative Education Program, as well as opportunities for financial support in the form of scholarships, loans, awards, and summer employment, are available to undergraduate and graduate students. Graduate programs are available leading to the M.S., M. Eng., and Ph. D.

Students majoring in mining engineering who are residents of Alabama, Delaware, Georgia, Louisiana, Maryland, Mississippi, South Carolina, and Tennessee may be eligible for the Academic Common Market, a program whereby residents of these states are eligible for Virginia in-state tuition. Those students falling into this category should contact the Office of Undergraduate Admissions for information.

The B.S. Degree in Mining Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Telephone (410) 347-7700.

Program of Study

First Year	
First Semester	
CHEM 1035: General Chemistry	3
CHEM 1045: General Chemistry Lab	1
ENGE 1024: Engineering Exploration	2
ENGL 1105: Freshman English (Area 1)	3
MATH 1205: Calculus (Area 5)	3
MATH 1114: Elementary Linear Algebra	2
Free Elective	2
Credits	**16**
Second Semester	
ENGE 1114 or ENGE 1104: Exploration of Engineering Design or Exploration of Digital Future	2
ENGL 1106: Freshman English (Area 1)	3
MATH 1206: Calculus (Area 5)	3
MATH 1224: Vector Geometry	2
PHYS 2305: Foundations of Physics I (Area 4)	4
Free Elective	3
Credits	**17**
Second Year	
First Semester	
ESM 2104: Statics	3
MATH 2224: Multivariable Calculus	3
GEOS 1004: Physical Geology (Area 4)	3
GEOS 1104: Physical Geology Lab (Area 4)	1
MINE 2504: Introduction to Mining Engineering	3
ENGE 2824: Civil Engineering Drawings and CAD	1
Liberal Education Area 2 Elective	3
Credits	**17**
Second Semester	
ESM 2204: Mechanics of Deformable Bodies	3
ESM 2304: Dynamics of Particles & Rigid Bodies	3
MATH 2214: Intro. to Differential Equations	3
MINE 2514: Mining Surveying	1
MINE 2524: Elements of Mine Design	3
Liberal Education Area 6 Elective	1
Liberal Education Area 7 Elective	3
Credits	**17**
Third Year	
First Semester	
ESM 3024: Introduction to Fluid Mechanics	3

ME 3114 or ME 3134: Engineering Thermodynamics or Fundamentals of Thermodynamics	3
MINE 3504: Rock Mechanics and Ground Control	3
MINE 3514: Rock Mechanics Lab. (Area 1, ViEWS)	1
MINE 3524: Excavation Engineering	3
MINE 3534: Mineral Processing	2
Credits	**15**
Second Semester	
GEOS 3104 or GEOS 3404: Elementary Geophysics or Elements of Structural Geology	3
MINE 3544: Mineral Processing Lab. (Area 1, ViEWS)	1
MINE 3554: Resource Recovery	2
MINE 3564: Underground Mine Design	3
MINE 3574: Surface Mine and Quarry Design	3
MINE 3584: Ventilation Engineering	3
Credits	**15**
Fourth Year	
First Semester	
ECE 3054: Electrical Theory	3
MINE 4504: Materials Handling and Power Sys.	3
MINE 4514: Health, Safety and Risk Management	3
MINE 4524: Project Engr. and Mine Management	3
MINE 4535: Senior Design Project (Area 1, ViEWS)	1
Liberal Education Area 3 Elective	3
Credits	**16**
Second Semester	
GEOS 4624: Mineral Deposits	3
MINE 4536: Senior Design Project (Area 1, ViEWS)	2
MINE 4544: Mine Reclamation and Environmental Management	3
MINE 4554: Mining Engr. Leadership Seminar	1
Liberal Education Area 2 Elective	3
Liberal Education Area 3 Elective	3
Credits	**15**

A total of 128 semester credits are required for graduation.

Foreign Language Requirement: Students who did not complete 2 units of a foreign language in high school must earn 6 credit hours of a college level foreign language, such credits to be in addition to those normally required for graduation.

Eligibility for Continued Enrollment: Upon having attempted 72 hours (including transfer, advanced placement, advanced standing, and credit by examination), "satisfactory progress" toward a B.S. will include the following minimum criteria:

- a grade point average of at least 2.0, and
- passing grades in MINE 2504, MATH 2214 and MATH 2224.

Liberal Education Area 7 Elective: If the Liberal Education Area 7 requirement is fulfilled with a course which double counts with another course on this checksheet, an additional three credit hour free elective must be completed.

Undergraduate Courses (MINE)

2504: INTRODUCTION TO MINING ENGINEERING
Introductory course covering the complete field of Mining and Minerals Engineering with special emphasis on the evolution of discrete mining systems, interaction of mining with the environment and the inter-relationship of Mining and Minerals Engineering with other disciplines. I (3H,3C)

2514: MINING SURVEYING
Specialized principles of field surveying as applied to the delineation of mineral deposits and the design and monitoring of surface and underground mining operations. Introduction to surveying instruments, field techniques, computation procedures and mapping. Pre: MATH 1224, ENGE 1024. (3L,1C) II.

2524: ELEMENTS OF MINE DESIGN
Basic concepts used in the modeling and design of mining systems including basic statistical concepts, sampling, geological and geostatistical modeling of ore bodies, ore reserve estimation, and selection of basic mine development methods. Pre: 2504, GEOS 1004. (2H,3L,3C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3074: HISTORY OF MINING
History and development of mining technology and law from prehistoric to modern times. The importance of the mining industry in society and its role in world development. Junior standing required. (3H,3C)

3094: ENERGY AND MINERALS IN SOCIETY
Trends in mineral consumption and the problems of meeting today's demands; mineral pricing; political influences; government regulation; the energy problem; alternative energy sources. Junior standing required. (3H,3C)

3504: ROCK MECHANICS AND GROUND CONTROL
Properties and behavior of geologic materials and masses and their classifications and ratings. Design principles of structures founded on and in rocks and basic aspects of ground control. I Pre: ESM 2204, GEOS 1004, MINE 2504. (3H,3C)

3514: ROCK MECHANICS LABORATORY
Laboratory techniques used in the determination of geologic materials properties and behavior. Determination of rock index properties, strengths, failure criterion and mechanical behavior. I Co: 3504. (3L,1C)

3524: EXCAVATION ENGINEERING
Rock fragmentation for excavation; drilling fragmentation, rock drilling systems; blasting fragmentation, types and properties of commercial explosives and accessories, system of initiation, design of blasting rounds, applications in mining and construction, structural damage criteria, overbreak control, safe practice and regulations; fragmentation by excavation machines; excavation system selection and design. I Co: 3504. (3H,3C)

3534: MINERAL PROCESSING
Principles of processing ores to recover valuable minerals. Basics of mineral processing including sampling theory, material balancing, slurry calculations, grade-recovery relationships, particle size analysis, process control. Unit operations including crushing, grinding and size separation. Applications to coal cleaning and crushed stone production. I Pre: ESM 2304, GEOS 1004. (2H,2C)

3544: MINERAL PROCESSING LABORATORY
Laboratory investigations of the unit operations and principles of mineral processing including ore preparation (size reduction, mineral liberation, and classification) and mineral recovery (froth flotation, electrostatic separation, magnetic separation, and solid-liquid separation). Co: 3554. (3L,1C) II.

3554: RESOURCE RECOVERY
Techniques for the separation and concentration of primary and secondary resources. Mineral concentration and waste recycling. Solid/solid concentration including gravity concentration, dense medium separation, froth floatation, magnetic separation and high tension separation. Solid/liquid separation including sedimentation/clarification, filtration and thermal drying. Overview of hydrometallurgical processing including leaching, solvent extraction and electrowinning. Pre: 3534, CHEM 1035. (2H,2C) II.

3564: UNDERGROUND MINE DESIGN
Design fundamentals of mining systems and stope development for tabular and massive underground mineral deposits. Equipment selection and application, permitting, cost analysis and production simulation. Pre: 2524, 3524. (3H,3C) II.

3574: SURFACE MINE AND QUARRY DESIGN
Surface mining methods, and their selection; mine planning and design; excavation, haulage and ancillary systems; equipment selection and maintenance; impoundment and piles design; mine closure/reclamation. Pre: 2524, 3524. (3H,3C) II.

3584: VENTILATION ENGINEERING
Subsurface ventilation systems. Ventilation planning and design, laws of airflow, airway resistance. Ventilation surveys, network analysis, ventilation economics. Ventilation software. Fan types, impeller theory, fan laws and testing. Mine ventilation thermodynamics. Pre: 2504, ESM 3024, ME 3114. (2H,3L,3C) II.

4054: COMPUTER APPLICATIONS IN MINING
Applications of computer programs to the estimation of ore reserves, the scheduling and planning of mine activities, the optimization of mine production, and the design and selection of equipment and support systems. Pre: 2524, 3564. (2H,2C)

4074: COAL PREPARATION
Unit operations of cleaning coals by physical and chemical processes, coal analysis and characterization, flowsheet design, evaluation of plant performance, process control, and simulation of coal preparation plants. I Pre: 3554. (2H,3L,3C)

4114: ECONOMICS OF MINERALS
Economic, technologic, and environmental aspects of mineral location, production, processing, and utilization. Junior standing required. (2H,2C) II.

4124: MINING LAW
Land ownership and mineral rights, withdrawals, environmental laws, locatable and leasable minerals, exploration permits, lease management, and mineral taxation. Pre: 2524. (2H,2C)

4134: SURFACE MINING CONTROL AND RECLAMATION
Design of engineering systems and methods to meet present environmental laws and regulations for surface mined land. Pre: 3574. (2H,2C)

4144: MARKETING AND TRANSPORTATION OF COAL
Markets, grade specifications, reserve requirements, contracts, schedules, and transportation of minerals to markets. Pre: 3554. (2H,2C)

4154: INTERMEDIATE ROCK MECHANICS
Theory and application of field instrumentation, simulation laws, and modeling in rock mechanics; dynamic response of rock; theory of rock bursts; stability of rock slopes, computer techniques of modeling, and monitoring. Pre: 3504. (3H,3C)

4164 (MSE 4164): PRINCIPLES OF MATERIALS CORROSION
Introduction to the scientific principles of materials corrosion and corrosion protection. Topics include: thermodynamics of materials corrosion, including potential- PH (Pourbaix) diagrams, kinetics of corrosion reactions and mixed potential theory, types of corrosion (uniform, galvanic, crevice, pitting, fatigue, stress corrosion cracking, intergranular, and hydrogen embrittlement), material/environmental factors that promote or prevent the various types of corrosion, and methods and techniques of corrosion testing. Co: MSE 4034 or ME 3114 or ME 3124 or ME 3134. I (3H,3C)

4174: COAL TECHNOLOGY
A broad-based background in coal technology, including origin of coal, classification, physical and chemical properties, beneficiation, combustion, carbonization, and chemical conversion. Pre: CHEM 1035, MATH 2214, PHYS 2305. (3H,3C)

4184: GROUND CONTROL
Design of structures in rock, support analysis and design, strata control in bedded formations, mass deformation and subsidence concepts, slope stabilization and monitoring. Pre: 3504, 3514. (3H,3C)

4504: MATERIALS HANDLING AND POWER SYSTEMS
Principles of materials handling, fluid power and electrical power systems for surface and underground mining operations. Engineering analysis and design of secondary haulage operations (belt conveyors, hoists, trucks, railways), fluid power systems (hydraulics, pumps, piping networks, compressors, pneumatic equipment). electrical systems (electrical machinery, distribution networks, controls), and other ancillary systems required to support mining operations. Assessment of equipment reliability and development of preventive maintenance programs. Pre: ESM 3024, ECE 3054. (3H,3C) II.

4514: HEALTH, SAFETY AND RISK MANAGEMENT
Study of risk analysis; mine legislation; mine gases, their occurrence, and physiological effects; methane emissions; dust classification, monitoring, and control; heat and humidity; psychrometry; physiological effects; climatic simulation; radiation monitoring and control; equipment hazards; noise; illumination; personal health and safety; fires and explosions; disaster management. I Pre: 3584. (3H,3C)

4524: PROJECT ENGINEERING AND MINE MANAGEMENT
Introduction to theory and practice of project engineering and management. Estimation of capital and operating expenditures. Cash flow development, worth evaluation, comparison of alternatives, taxation/depreciation and optimization. Principles of financial management, accounting and resource utilization. Topical seminars by industrial representatives. I Pre: 3564, 3574. (3H,3C)

4535-4536: SENIOR DESIGN PROJECT
Investigation of a significant design problem in mining engineering under the supervision of a staff member. Periodic progress reports and submission of a comprehensive final design project including detailed drawings, engineering calculations, economic feasibility, and environmental impacts. I Co: 4524 for 4535. 4535: (3L,1C) 4536: (6L,2C)

4544: MINE RECLAMATION AND ENVIRONMENTAL MANAGEMENT
Statutory and regulatory controls on the mining environment. Air, water and land pollutants, standards, monitoring systems, and prevention and control techniques. Unique environmental issues, Surface Mine Conservation and Reclamation Act (SMCRA), endangered species, environmental impact statements, permitting, environmental audits and torts. Pre: 3564, 3574. (3H,3C) II.

4554: MINING ENGINEERING LEADERSHIP SEMINAR
Invited speakers, short-courses and workshops on subjects related to leadership issues in mining and minerals engineering. Technology and design; mining finances and marketing; management and business concerns; labor relations and leadership; team building, motivation, and communications; problem solving and performance measurements; environmental issues; permitting and regulatory requirements. Senior standing required. (3L,1C) II.

4604: MINERAL PROCESSING SIMULATION AND CONTROL
Principles of processing minerals and coal including analysis of flowsheets and unit operations, mass balance calculations, mathematical modeling, simulation and control of mineral and coal processing operations. Pre: 3554. (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course. X-grade allowed.

TOP

College of Engineering Programs of Study
Engineering Education | Aerospace and Ocean Engineering | Biological Systems Engineering | Chemical Engineering
Civil and Environmental Engineering | Computer Science | Electrical and Computer Engineering
Engineering Science and Mechanics | General Engineering | Industrial and Systems Engineering
Materials Science and Engineering | Mechanical Engineering | Mining Engineering

College of Liberal Arts and Human Sciences

www.clahs.vt.edu/

Dean: Sue Ott Rowlands
Associate Dean for Academic Policies and Procedures: Debra Stoudt
Associate Dean for Administration and Finance: Brian Shabanowitz
Associate Dean for Graduate Studies and Research: Fred Piercy
Associate Dean for Professional Education and Director of the School of Education: Susan Magliaro
Associate Dean for Undergraduate Academic Affairs: Rachel L. Holloway

The college offers minors in many of the departments listed. Students are encouraged to include a minor in their program and should consult an advisor for help in choosing one that will advance their career goals.

Overview

The College of Liberal Arts and Human Sciences offers baccalaureate degrees encompassing the humanities, performing arts, and human and social sciences. The College emphasizes the importance of mastering the intellectual skills a liberal arts education develops as well as job skills by encouraging students to apply knowledge from one field to another and to think creatively.

Outstanding faculty members conduct research and teach courses in 15 departments leading to baccalaureate and advanced degrees. Coursework from the College of Liberal Arts and Human Sciences also provides a foundation of knowledge of a number of fundamental subjects for students in all colleges in the Curriculum for Liberal Education.

General Requirements for Graduation

A student in the College of Liberal Arts and Human Sciences must complete at least 120 hours for an undergraduate degree as well as satisfy the following requirements:

- achieve a minimum overall Grade Point Average (GPA) of 2.0 for all hours attempted (some majors may require a higher GPA)
- achieve a minimum overall GPA of 2.0 for all hours attempted in all work applied to the major (some majors may require a higher GPA)
- complete all other requirements established for their degree by the major department
- complete all college and university Curriculum for Liberal Education requirements

No course required for graduation or in the major/minor may be elected to be taken on a pass/fail basis (i.e., pass/fail may be used for free electives only). This excludes courses that are offered pass/fail only.

College Curriculum for Liberal Education

A description of the Curriculum for Liberal Education may be found in the Academics chapter of this catalog. For requirements specific to departments in the College of Liberal Arts and Human Sciences, please contact the individual department.

The Honors Program

The University Honors Program is available to students in the College of Liberal Arts and Human Sciences. These programs provide an enriched environment for qualified students who are highly motivated and possess outstanding scholastic ability. Specific requirements for the three possible honors degrees are available from the University Honors Program, participating departments and the Office of Undergraduate Academic Affairs.

Dean's List

A student enrolled in the College of Liberal Arts and Human Sciences for 12 hours or more for grade (A-F) who earns a GPA of 3.4 or higher during the fall or spring semesters is awarded a Dean's List certificate.

Pre-Professional Advising

The University provides pre-professional career advisors for all disciplines. Pre-law, pre-dentistry, pre-medicine, and pre-veterinary medicine advisors are available. In addition, several majors in the College of Liberal Arts and Human Sciences offer pre-law concentrations which students may take if they are interested in pursing a graduate program in law.

The College of Liberal Arts and Human Sciences' School of Education provides preparation of educational professionals through programs at the graduate level. These graduate programs meet state and national accreditation standards and are designed to promote teaching, research, and service.

Scholarships

A number of scholarships are available for outstanding students enrolled in the College of Liberal Arts and Human Sciences. Descriptions and deadlines are available on the college website.

Students who are interested in applying for financial merit-based aid should contact the University Office of Scholarships and Financial Aid.

Undergraduate Research

Undergraduate research is a commitment of the college. The Undergraduate Research Institute aims to expose undergraduates to investigation, inquiry, and creative expression in the liberal arts and human and social sciences, enhancing the opportunities for advanced research initiatives, elevating the visibility of that research, and providing access to a variety of resources for student development and faculty mentorship. Departments within the College of Liberal Arts and Human Sciences have a variety of research opportunities in which students may choose to participate. Students interested in undergraduate research should contact the department where they wish to conduct research or the Undergraduate Research Institute for assistance.

Internships, Co-Op Opportunities and Study Abroad

Students are encouraged to participate in Internship and Co-op opportunities to gain relevant work experience prior to graduation. Department career advisors can help students identify opportunities. In some cases students can receive credit for qualifying work experience. Study abroad experiences are highly encouraged for students in the College of Liberal Arts and Human Sciences and students should meet with their academic advisor or contact the Office of Undergraduate Academic Affairs for information.

Career Advising

Career advising is available from a number of sources. The university offers centralized career services and on-campus interviewing. The

College of Liberal Arts and Human Sciences works with employers interested in hiring students with degrees from the college and organizes employer panels and information sessions specifically tailored to majors in the college. The college also co-hosts two career fairs each year, one in the fall semester and one in the spring semester. The college offers a 1-credit course, LAHS 3004, Professional Seminar designed specifically for liberal arts and human sciences majors as they prepare for careers and/or graduate and professional school. Additionally, every major has a departmental career advisor who specializes in guiding students from their field towards career success.

Graduate Programs in the College of Liberal Arts and Human Sciences

College of Liberal Arts and Human Sciences departments all offer graduate degrees at both the Master's and Ph.D. levels. Complete information on these programs including descriptions of graduate courses can be found in the Graduate Catalog.

Courses (LAHS)

1104: PROFESSIONAL PERSPECTIVES
Introduction to the heritage and professional characteristics of the programs in the College of Liberal Arts and Human Sciences. Emphasis on assisting new students in the college with academic goals, strategies, and academic plans of study. (1H,1C)

2204: APPALACHIAN FAMILY&ENVIRONMENT
Characteristics of the people of Central and Southern Appalachia are emphasized: past and present, including family relationships, food practices, clothing, and
housing constraints. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: PROFESSIONAL SEMINAR
Designed specifically for liberal arts and human sciences majors, this course prepares students for careers and/or graduate school. Interviewing, resume writing, the graduate school application process, writing personal statements, electronic job searching, and diversity issues in the workplace are examples of topics covered. Pre: Junior or Senior standing. Major within the College of Liberal Arts and Human Sciences, Junior standing preferred. (1H,1C)

3914: SURVEY OF RESEARCH METHODS FOR THE LIBERAL ARTS AND HUMAN SCIENCES
Survey of research methods and technologies used in the Liberal Arts and Human Sciences disciplines. Disciplinary and cross disciplinary research methods including quantitative, qualitative, mixed and creative approaches, research proposals, computer based research applications, interpretation of research articles, identification of funding sources and preparation for conference presentations are some of the topics to be covered. Designed to complement discipline based research methods courses and foster development of research skills and interest. Pre: Junior or Senior standing required. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

3984: SPECIAL STUDY
Variable credit course.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Liberal Arts and Human Sciences

Air Force ROTC

www.af.vt.edu/

Russell K. Walden, Col., USAF, Head
Professor: R. K. Walden
Assistant Professors: C. S. Andersen; K. W. Gay; J.D. Leck; K. D. Pond
Unit Admissions Officer: K. D. Pond (231-8026)
Administrative Assistant: Connie Moses (231-6404)

Overview

The Air Force Reserve Officer Training Corps (AFROTC) provides a program of leadership development which prepares college men and women for service as commissioned officers in the United States Air Force. After graduation, they assume active duty positions in both flying and non-flying specialties. To accomplish this, the Department of Aerospace Studies recruits, selects, retains, and commissions officer candidates as second lieutenants in the United States Air Force. AFROTC:

- Provides ethics and values education, stressing the Air Force core values of integrity first, service before self, and excellence in all we do.
- Prepares cadets to be commissioned as second lieutenants through a curriculum which develops leadership and management skills and provides opportunities to use these skills in a variety of practical applications.
- Provides an understanding of how to lead and influence small organizations, with a strong emphasis on personal integrity, honor, and individual responsibility. The techniques of effective leadership and quality management are stressed to achieve mission accomplishment.
- Enhances the cadets' understanding of the role of the military in society and provides an in-depth orientation to history and tradition of the Air Force and how the Air Force serves the nation. This goal is reinforced by summer hands-on leadership training and career orientation opportunities at Air Force bases around the country.
- In conjunction with the Virginia Tech Corps of Cadets, provides programs and experiences which increase self-confidence, self-discipline, accountability, physical stamina, poise, and other traits essential to the development of a leader of character who is prepared to serve the nation or the commonwealth both in and out of uniform.

The curriculum and leader development programs of the Department of Aerospace Studies are mentally and physically challenging. Cadets learn basic military skills and participate in a demanding physical conditioning program starting in the freshman year. The program moves progressively from followership to leadership experiences and culminates with the senior class cadets planning, organizing, and administering all leadership training for the cadet group. On-campus instruction is conducted both in the classroom by Air Force officers and in the field environment by both officer and cadet leaders. Semiannual visits to Air Force bases expand the cadets' knowledge of Air Force operations and life-style. A demanding summer field training encampment prior to the junior year prepares the cadet for acceptance into the commissioning track.

Air Force ROTC offers four-, three-, and two-year tracks. Four- and three-year track cadets must complete 8 semester hours of AFROTC academics prior to a four-week summer encampment. The two-year track cadets complete a six-week summer encampment where they receive the freshman and sophomore academic courses in addition to the normal four-week field training course of instruction. Students who have Junior ROTC, other-service ROTC, national guard, reserve, or active duty military experience may request credit and advanced placement.

Scholarships

Air Force ROTC offers four-, three-, and two-year scholarships which are based on merit, not need. Though scholarship awards vary, most pay all tuition, books, and approved university fees. High school seniors who are interested in the four-year or guaranteed three-year scholarships must apply at www.afrotc.com by Dec. 1 of their senior year. Non-scholarship cadets may apply for three- and two-year scholarships during their freshman and sophomore years. All students who are contracted into the AFROTC program (includes all scholarship winners and those juniors and seniors holding a commissioning contract) receive a tax-free stipend of up to $500 per month while in school.

Virginia Tech requires membership in the Virginia Tech Corps of Cadets to be enrolled in ROTC. All freshman and sophomore cadets, as

well as contracted junior and senior cadets, receive a special Air Force uniform allowance to offset the cost of cadet uniforms. The Corps of Cadets also provides need- and merit-based scholarships for deserving cadets.

Membership in the Virginia Tech Corps of Cadets and completion of four years of Air Force ROTC may qualify a student to receive a minor in leadership. The leadership progression program of the Corps of Cadets and the leadership education inherent in the AFROTC program in combination allow the student to earn this leadership minor -- an academic achievement only available at Virginia Tech. Contact the Rice Center for Leader Development, 540-231-9455, for information on how to apply for the leadership concentration.

Air Force ROTC builds leaders and offers every student who successfully completes the program a job upon graduation. The basic requirements for commissioning are: award of a degree from Virginia Tech including 24 hours of AFROTC; be a U.S. citizen of good moral character; meet medical and physical standards; achieve passing scores on the Air Force Officer Qualifying Test; and willingly accept a four-year service commitment.

Undergraduate Courses (AS)

1115-1116: INTRODUCTION TO THE AIR FORCE
Introduction to the United States Air Force and Air Force Reserve Officer Training Corps. Mission and organization of the Air Force, officership and professionalism, military customs and courtesies, Air Force officer opportunities, and introduction to communication skills. Co: 2944 for 1115. (1H,1C) 1115: I; 1116:

2115-2116: THE DEVELOPMENT OF AIR POWER
Study of air power from balloons through the jet age. Historical review of air power employment. Evolution of air power concepts and doctrine. Air Force communication skills Pre: 1115, 1116. Co: 2944 for 2115. (1H,1C)

2944: AFROTC LEADERSHIP LABORATORY
Experiential learning laboratory that allows cadets to practice and demonstrate mastery of leadership skills essential to an Air Force officer. May be taken eight times. Pass/Fail only. Membership in Virginia Tech Corps of Cadets required. Pass/Fail only. Co: 1115, 1116, 2115, 4216, 3215, 3216, 4215, 2116. (4L,1C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3215-3216: AIR FORCE MANAGEMENT AND LEADERSHIP
Integrated leadership study emphasizing concepts and skills. Motivational and behavioral processes, management, military ethics, communication, and group dynamics. Examines case studies and scenarios. Pre: 2116. Co: 2944 for 3215. (3H,3C)

4215-4216: NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY
Examines the formulation, organization, and implementation of national security; evolution of strategy; management of conflict; and civil-military interaction. Military profession, officership, and the military justice system. Air Force communication skills. Pre: 3216. Co: 2944 for 4215. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

Liberal Arts and Human Sciences

Apparel, Housing, and Resource Management

www.ahrm.vt.edu/

A University Exemplary Department

LuAnn R. Gaskill, Head
Residential Property Management Advisory Board Professor: R.C. Goss
International Textile and Apparel Association Fellow: M.J.T. Norton
Professors: J.O. Beamish; L.R. Gaskill; R.C. Goss; D.H. Kincade; M.J.T. Norton; K. Parrott
Associate Professors: H.I. Chen-Yu; J.M. Emmel; I.E. Leech; C.R. Hayhoe
Assistant Professors: S. Anong; P.J. Fisher; J. Kim; K. Mitchell

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Overview

The mission of the Department of Apparel, Housing, and Resource Management is to improve quality of life for individuals, families, and the broader community by creating and extending knowledge in apparel, housing, and resource management. We apply business, consumer, and design perspectives to teaching and learning, research, and outreach.

The AHRM Department includes three areas of program concentration--**Apparel, Housing, and Resource Management**. The following statements briefly describe the program concentrations.

Apparel focuses on the domestic and international concerns of apparel and textile consumers, manufacturers and retailers. Basic to these concerns are social, cultural, political, economic, and technological factors that affect consumer satisfaction with apparel and other textile products. The program prepares students for careers in business and government services through required courses that build essential knowledge and skills relevant to the design, production, marketing, distribution, and use of apparel and textile products. The Apparel option is Apparel Product Development and Merchandising Management.
Housing focuses on the residential environment, especially planning, design, marketing and management. Required courses emphasize both human and business factors, including current issues and practices, which influence the environment of housing. Field work experiences and professional contacts supplement students' course work in housing, business, residential design, and related subjects. The program prepares students for careers in residential property management, the kitchen and bath industries, and other businesses and agencies involved in the design, development and management of housing. The program includes options in Housing and Residential Property Management.
Resource Management focuses on the principles and processes involved in recognition, creation and allocation of human and material resources to foster well-being. Consumer studies courses build students' knowledge of households in the dual roles of consumers and producers in a global market affected by government policy, and enable students to analyze issues from the consumer, business, and government perspectives. Financial counselors provide debt crisis management and budgeting advice to those who may be experiencing problems managing their personal finances. The program prepares students for careers in consumer affairs, human resources, marketing and sales, credit and business management.

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Apparel Product Development and Merchandising Management Option

Career Advisor: Doris Kincade

The Apparel field addresses the domestic and international concerns of apparel and textile consumers, manufacturers and retailers. The

Apparel program prepares students for careers in business, industry, and government services. Apparel Product Development and Merchandising Management (APDM), the name of the option in the Apparel program, reflects the diverse career opportunities available to graduates of the program.

Students may find employment with apparel or textile manufacturers or with various types of retailers or fashion media. Students specializing in APDM may be employed in the areas of product development and merchandising. The numerous positions in these areas include account representative, buyer, fashion coordinator, fashion journalist, merchandise manager, production manager, sourcing analyst, store manager, technical designer, visual merchandiser, among others for many types of fashion and special-use apparel and accessories.

Individuals employed in today's apparel and textile industries need to understand both product development and merchandising management. The APDM option is designed to build students' knowledge and skills in the development, production, marketing, distribution, and use of apparel and textile products. The Curriculum for Liberal Education furthers students' knowledge by providing a broad liberal education.

Courses in the APDM option allow students to gain experience in the product development process, computer-aided design, textile and apparel evaluation, merchandise planning, buying, and promotion, presentation techniques, consumer buying behavior, and economics of the textile and apparel industry. Supporting courses in accounting, management, and marketing enhance career preparation. Through coursework, internships, study tours, student organizations, and interaction with industry experts, students become prepared to enter the field.

Required:	
AHRM 1204	Clothing and People
AHRM 1214 or AHRM 2984	Fashion Presentation Techniques or Introduction to CAD in Clothing and Textiles
AHRM 1224	Basic Apparel Assembly
AHRM 2204 & 2214	Introduction to Textiles & Apparel Textiles Lab
AHRM 2264	Introduction to the Fashion Industry
AHRM 2404	Consumer Rights
AHRM 3104	Fashion Retailing Concepts
AHRM 3204	Introduction to Textile Evaluation
AHRM 4034	History of Costume
AHRM 4124 or MKTG 4204	Clothing Behavior Patterns or Consumer Behavior
AHRM 4214	Economics of the Textile and Apparel Industry
AHRM 4224	Fashion Analysis and Communication
AHRM 4234	Apparel Quality Evaluation
AHRM 4264	Merchandising Strategies
AHRM 4984	Multichannel Retailing
AHRM 4984	Small Apparel Business Management and Entrepreneurship
ACIS 2004	Survey of Accounting
ECON 2005-2006	Principles of Economics
LAHS 3004	Professional Seminar
MGT 3304	Management Theory and Leadership Practice
MKTG 3104	Marketing Management
SOC 1004 or PSYC 2004	Introductory Sociology Introductory Psychology
Select at least one of the following courses:	
ACIS 1504	Intro to Business Information Systems
COMM 2004	Public Speaking
ENGL 3764	Technical Writing
Select at least one of the following courses:	
AHRM 2014	Advanced Apparel Assembly
AHRM 3954	European Study Abroad

AHRM 4244	New York Fashion Study Tour
AHRM 4664	Universal Design
AHRM 4964	Field Study
AHRM 4974	Independent Study
AHRM 4984	Global Apparel Production and Trade
AHRM 4994	Undergraduate Research
BIT 2405	Quantitative Methods
STAT 2004	Introductory Statistics
Select one of the following courses:	
MGT 3324	Organization Behavior
MGT 3334	Introduction to Human Resource Management
MKTG 3504	Advertising
MKTG 4554	Buyer – Seller Relationships
MKTG 4604	Retail Management

TOP

Housing Option

Career Advisor: K. Parrott

The Housing Option focuses on the residential environment, especially planning, design, and marketing. Required courses emphasize design, human, social, and business factors, including current issues and practices, which influence the environment of housing. The diversity of the population with differing needs, the range of available products, the growth of regulation, the increased concern for health and safety, and the rapid changes in technology are among the factors that lead to a very complex market place in the housing industry.

There will be many opportunities for graduates of the Housing Option, especially as certified kitchen or bath designers, which provide employment as well as business opportunities. Other employment opportunities include manufacturing and sales of kitchen, bath and other residential products, residential construction, home furnishings, appliances, and related industries. The future looks bright for those students who choose careers in the housing industry. A number of trend and demographic indicators suggest that people will continue to spend money on their homes and need products and services from experts. There will be a strong, on-going need in the housing industry for well-educated professionals with specialized knowledge in design and the ability to think and solve complex problems.

The program in kitchen and bath design is accredited by the National Kitchen and Bath Association, and interested students can prepare to sit for the first level design certification examination immediately after graduation. All students in the option are mentored by industry members of the Center for Real Life Kitchen Design Advisory Board. Classroom learning is expanded through field trips, guest speakers, community clients, internships, competitions, and other special projects.

Required:	
AHRM 2204	Introduction to Textiles
AHRM 2254	Idea Development and Creativity
AHRM 2404	Consumer Rights
AHRM 2504 or AHRM 2304	Resource Management for Individuals and Families Family Financial Management
AHRM 2614/2634	Introduction to Residential Technologies & Laboratory
AHRM 2604/2624	House Planning & Studio Laboratory
AHRM 2675	Residential Property Management I
AHRM 3604	Housing and the Consumer
AHRM 3624	House Planning II
AHRM 4604	Housing: Energy and the Environment
AHRM 4614	Advanced Residential Technologies
AHRM 4624	Advanced Kitchen and Bath Design
AHRM 4634	Housing and Society
AHRM 4664	Universal Design

AHRM 4964	Field Study
ART 2385-2386	Survey of the History of Western Art
ECON 2005-2006	Principles of Economics
ACIS 2004	Survey of Accounting
MKTG 3104	Marketing Management
MKTG 4554	Buyer - Seller Relationships

In addition to these courses, students develop a supporting area of study by completing a minor or cognate.

Residential Property Management Option

Career Advisor: R. C. Goss

The residential property management option was developed in 1985 in response to industry demand for more and better-educated professionals. Today residential property management is a fast-growing career sector with hundreds of management positions available each year in communities that range from luxury apartment developments to innovative senior living communities. Graduates typically choose among several employment offers and enjoy quick advancement.

The curriculum offers a wide-ranging program of study that includes specific courses in property management, as well as supporting courses in business, housing, and human relations. All students complete an internship where they gain real-world experience, make valuable career contacts, and explore different career areas. RPM's very active advisory board visits campus twice yearly. Board members act as mentors and provide financial support for field trips, professional development, and scholarships. RPM seniors prepare for and take the National Apartment Association's CAM (Certified Apartment Manager) exam. Graduating with this credential places new employees a year or more ahead of other entry-level peers.

Required:	
AHRM 2675-2676	Residential Property Management
AHRM 2614	Introduction to Residential Technologies
AHRM 2404	Consumer Rights
AHRM 2504	Resource Management for Individuals and Families
AHRM 2604	House Planning
AHRM 3614	Maintenance for Property Managers
AHRM 4604	Housing: Energy and the Environment
AHRM 4664	Universal Design
AHRM 4674	Managing and Marketing Housing for Later Life
AHRM 4684	Advanced Property Management
AHRM 4694	Contemporary Issues in Property Management
AHRM 4964	Field Study
AHRM 4984	Special Study
ACIS 1504	Introduction to Business Information Systems
ACIS 2004	Survey of Accounting
ECON 2005-2006	Principles of Economics
FIN 3104	Introduction to Finance
MGT 3304	Management Theory and Leadership Practice
MKTG 3104	Marketing Management
UAP 4744	Principles of Real Estate
COMM 3164	Group Processes and Presentations

TOP

Resource Management

Consumer Studies Option

Career Advisor: I. Leech

The consumer studies option prepares students to enter a variety of careers in the public and private sectors. Central to these careers is the ability to analyze issues and problems from the perspectives of consumers, business, and government. Students learn to reasonably advocate consumer interests and to help consumers improve their well-being. They develop fundamental skills that are used to resolve problems faced by consumers in the market place and the work place.

Graduates enter careers related to consumer affairs, marketing and sales, business management, and human resources. Required courses build a thorough understanding of households in the dual roles of producers and consumers that function within an international economic marketplace affected by government policy and regulation. Students study current events to track changing conditions and public policy. Additional courses develop skills for effectively processing and conveying information. A choice of controlled electives enables a student to tailor study to consumer business management, consumer public relations, consumer financial services, consumer housing counseling, or consumer health promotion.

Consumer Studies students are provided a variety of learning experiences on- and off-campus. Through involvement with student professional associations, as well as relevant state and national organizations, students can develop leadership and organizational skills and network with active professionals. There are opportunities to relate classroom learning to the "real world" with projects and visits with industry, legislators, and regulators. An individualized study experience, typically an internship related to personal career interests, is required.

Required:	
ACIS 1504	Introduction to Business Information Systems
AHRM 2304	Family Financial Management
AHRM 2404	Consumer Rights
AHRM 2504	Resource Management for Individuals and Families
AHRM 4314	Debtor-Creditor Relationships
AHRM 4404	Consumer Protection
AHRM 4414	Professionalism in Consumer Affairs
AHRM 4504	Advanced Resource Management
AHRM 4964, 4974, 4994	Individual Study
COMM 2004	Public Speaking
ECON 2005-2006	Principles of Economics
ENGL 3764	Technical Writing
HD 3004 or HD 3324	Human Development II Family Relationships
MGT 3304	Management Theory and Leadership Practice
MKTG 3104	Marketing Management
STAT 3604	Statistics for the Social Sciences
LAHS 3004	Professional Seminar
Twenty one credit hours in one of the following areas:	
Consumer Business Management	
Consumer Public Relations	
Consumer Financial Services	
Consumer Housing Counseling	
Consumer Health Promotion Family Financial Management	

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Satisfactory Progress

Apparel Design Option and Merchandising Management Option: For satisfactory progress toward a degree, the following courses must be completed by the time 72 hours have been completed:
ENGL 1105-1106, ECON 2005-2006, PHYS, BIOL or CHEM (from approved Curriculum for Liberal Education, MATH 1015-1016 or 1525-1526; AHRM 1204, 1224, 2264, 2204, 2214, 2024, 2254; LAHS 1104; SOC 1004 or PSYC 2004; ACIS 2004. Apparel Design option also requires AHRM 2024 and 2254.

Housing Option: For satisfactory progress toward a degree, the following courses must be completed by the time the student has attempted 75 semester hours: AHRM 2254, AHRM 2604, AHRM 2624.

Residential Property Management Option: For satisfactory progress toward a degree, the following courses must be completed by the time the student has attempted 72 semester hours: ENGL 1105-1106; ECON 2005-2006; 6 hours of Natural Science; 6 hours of Curriculum for Liberal Education approved Humanities; MATH 1015-1016.

Consumer Studies Option: For satisfactory progress toward a degree, the following courses must be completed by the time the student has attempted 72 semester hours: ENGL 1105-1106; ECON 2005-2006; 6 hours of Natural Science; 6 hours of Curriculum for Liberal Education approved Humanities; MATH 1015-1016.

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Course Descriptions (AHRM)

1204: CLOTHING AND PEOPLE
A personal and societal approach to the study of clothing and its importance in people's lives. Social, psychological, and economic forces that affect clothing behavior of individuals and groups. Fundamentals of clothing and textiles importance to consumers. (3H,3C)

1214: FASHION PRESENTATION TECHNIQUES
Basic principles and methods for executing fashion and specification illustrations and technical flats. Practice and skill development using a variety of manual and computer tools. Emphasis on the correct use of correct industry terminology. Variable credit course.

1224: BASIC APPAREL ASSEMBLY
Application of principles and concepts used in the assembly of basic apparel products. The relationship between garment quality and factors of time, construction techniques and resources. (1H,6L,3C)

2014: ADVANCED APPAREL ASSEMBLY
Application of principles and concepts of advanced apparel assembly to finished products. Prototype development and advanced dressmaking techniques applied to clothing for men, women, and children. (1H,4L,3C)

2024: APPAREL STRUCTURE AND FIT
Mastery of fitting and alteration concepts. Understanding of the principles and methods used in garment structure and design. Pre: 2014. (1H,6L,3C)

2204: INTRODUCTION TO TEXTILES
Structure, properties and basic production of textiles and textile components: natural and manufactured fibers; yarns; woven, knit, nonwoven fabrics; mechanical and chemical finishes; colorants and coloration methods. Influence on performance of apparel and interior textile products. Sophomore standing and one semester (lecture and lab) of university core requirement in Scientific Reasoning and Discovery is required. (3H,3C)

2214: APPAREL TEXTILES LABORATORY
Identification and characterization of textiles and textile components including: fabrics, finishes and coloration. Influence of these structural parameters on performance of apparel textiles. (3L,1C)

2224: INTERIOR TEXTILES LABORATORY
Identification and characterization of textiles and textile components used in draperies, upholstery, and carpets. Performance testing of interior textiles to determine suitability for a selected interior. (2L,1C)

2244 (AAEC 2244): FOOD AND CLOTHING: CULTURAL TRADITIONS, CONFLICTS AND POSSIBILITIES
Survey of basic ideas underlying values and cultural traditions expressed in food and clothing. Ethical perspectives in Western and Non-Western schools of thought. Application to issues involving food and clothing, such as product liability, food and clothing safety, animal rights and the use of fur, labor sweatshops, sourcing of inputs, endangered species, rain forests, consumer sovereignty, freedom and economic justice. Sophomore standing is required. II (3H,3C)

2254: IDEA DEVELOPMENT & CREATIVITY
Development of an idea through the design process generated by creativity. Basic design elements and principles are examined in apparel and housing products. The design process is framed by needs assessment, prototype development, and evaluation. Emphasis on developing the student's creativity abilities. Exploration of professional designers' ideas, creativity, and processes. (3H,3C)

2264: INTRODUCTION TO THE FASHION INDUSTRY
Organization and operation of producers and distributors and of career opportunities in the fashion industry. Basic principles governing fashion movement and change. Pre: 1204. (3H,3C)

2304: FAMILY FINANCIAL MANAGEMENT
Overview of family financial management. Analysis of financial situations of individuals and families; assessment of needs for cash and credit management, insurance, tax savings, and investments; introduction to components of a comprehensive family financial plan. (3H,3C)

2404: CONSUMER RIGHTS
Changing role of consumers in American society from the perspective of the consumer interest. Consumers' legal and moral rights, responsibilities and means for successfully obtaining redress of grievances. Processes of government regulation and policy making that affect consumers. Current consumer problems and issues in such areas as ripoffs and frauds, food, health care, product
safety, banking, credit, housing, insurance and investments. (3H,3C)

2504: RESOURCE MANAGEMENT FOR INDIVIDUALS AND FAMILIES

Introduction to resource management concepts and theories with application to personal and family life goals. (3H,3C)

2604: HOUSE PLANNING
Principles of space planning and housing design in relation to individual and family activities, needs, and preferences. Introduction to house construction. Reading visual presentations of housing designs. (2H,2C)

2614: INTRODUCTION TO RESIDENTIAL TECHNOLOGIES
Principles underlying the selection, use and care of equipment and lighting in the home and the infrastructure that supports home technologies. (2H,2C)

2624: HOUSE PLANNING LABORATORY
Principles of visual presentation of housing designs. Introduction to hand and computer drafting. Co: 2604. (2L,1C)

2634: RESIDENTIAL TECHNOLOGIES LABORATORY
Basic principles of home technologies and their applications in the home. Co: 2614. (2L,1C)

2675-2676: RESIDENTIAL PROPERTY MANAGEMENT
2675: The history of property management, roles and responsibilities of managers, developing effective marketing strategies, fair housing, and landlord-tenant law. 2676: The operation and management of residential properties including detailed examination of financial aspects of residential property management. (3H,3C)

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014: ADVANCED PATTERNMAKING
Advanced principles and techniques of flat pattern apparel structures. Illustration of apparel structures on the fashion figure. Construction of an original design. Must have prerequisites or equivalent. Pre: 2024. (1H,4L,3C)

3104: FASHION RETAILING CONCEPTS
Detailed investigation and analysis of the fundamentals of fashion merchandising concepts emphasizing problem solving at the retail level. Pre: 2264, (ACIS 2004 or ACIS 2115). (3H,3C)

3204: INTRODUCTION TO TEXTILE EVALUATION
Analysis of the performance properties of fabrics. Importance of evaluation to product development, quality control, and specification of care requirements. Pre: 2204, 2214. (2H,3L,3C)

3464 (EDHL 3464) (GEOG 3464) (HD 3464) (HUM 3464) (SOC 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. 2000-level course in any cross-listing department is required. (2H,3L,3C)

3604: HOUSING AND THE CONSUMER
Overview of housing as it relates to consumer needs, values, lifestyles, norms and constraints. Includes structural and tenure alternatives, financial and legal considerations, house design, neighborhood choices, the home buying process, and future directions in housing. (3H,3C)

3614: MAINTENANCE FOR PROPERTY MANAGERS
Maintenance principles, routine maintenance procedures, and maintenance terminology used with commercial and residential property. Pre: 2676. (3H,3C)

3624: HOUSE PLANNING II
Principles of space planning, including activity analysis and user needs, as applied to residential settings. Graphic design solutions for specific areas of the home, including social, private, kitchen, and outdoor areas. Pre: 2254, 2604, 2624. (6L,3C)

3954: STUDY ABROAD
Variable credit course.

4014: SENIOR STUDIO
Principles and techniques of pattern design through the draping method. Pre: 3014. (1H,6L,3C)

4024: PORTFOLIO
The development and production of a professional design portfolio. Pre: 4014. (1H,3L,2C)

4034: HISTORY OF COSTUME
A study of costume which people of various cultures have worn throughout history. Pre: 1204. (3H,3C)

4044: PATTERN GRADING

Conceptual understanding and implementation of grading techniques, used in apparel engineering, for increasing and decreasing a standard size pattern to a range of sizes. Computer applications. Grading of an original design. Pre: 3014. (1H,4L,3C)

4124: CLOTHING BEHAVIOR PATTERNS
Study of clothing behavior of individuals in relationship to their needs, values, attitudes, interests, and self-concepts. Overview of principles and theories related to individuals' emotional, mental, and physical activities when obtaining, using, maintaining, and disposing of apparel products so as to satisfy their needs and desires. Application of principles and theories related to clothing behavior to the analysis of consumer and the development of effective merchandising strategies. Pre: 3104, PSYC 2004 or SOC 1004. (3H,3C)

4214: ECONOMICS OF THE TEXTILE AND APPAREL INDUSTRY
Study of the various segments of the textile and apparel industry. Analysis of the market structure and functioning of each segment and of factors currently affecting the industry. Pre: 2214. (3H,3C)

4224: FASHION ANALYSIS AND COMMUNICATION
Analysis of factors influencing fashion change and acceptance. Application of effective promotional activities to trade, national, and retail levels of fashion merchandising. Senior standing required. Pre: 2264, MKTG 3104. (3H,3C)

4234: APPAREL QUALITY EVALUATION
Study of quality of ready-to-wear apparel and factors that influence variations in the aesthetic and functional performance of the end product, including consumer perceptions and expectations, manufacturing processes and trends, and the physical components of the end product. Pre: 1224, (3204 or 4204). (3H,3C)

4244: NEW YORK FASHION STUDY TOUR
Integrative study of methods of operating at all levels within the fashion industry. Special emphasis on design, merchandising, and promotional activities. Seminars on campus and at pre-arranged appointments during a five-day stay in New York. AHRM major; Junior standing. Twelve hours of AHRM courses required. (3H,3C)

4254: TEXTILE PRODUCTION PROCESSES
Analysis of textile production processes will include focus on a particular aspect of production for each individual. Field work will be conducted at textile manufacturing plants. Pre: 4204. (2H,3L,3C)

4264: MERCHANDISING STRATEGIES
A senior capstone course providing students with experience in synthesizing and using course content learned throughout their apparel program. Includes projects in forecasting, product development and promotions as used in the apparel industry in preparing and positioning products in the market. Pre: 3104, 3214, 4224. (3H,3C)

4314: DEBTOR-CREDITOR RELATIONSHIPS
Examination of legal and operational aspects of debtor-creditor relationship from the perspective of businesses and debtors. Overview of the types of credit, access to credit, factors contributing to debt problems, and alternatives available for resolution. Focus on collection processes of federal and state bankruptcy laws and regulations. (3H,3C)

4324: FINANCIAL COUNSELING
Examination of debt and budgeting problems affecting families. Utilizes a problem-solving approach. Includes financial counseling strategies for coping with financial crises and becoming proactive in family financial management. (3H,3C)

4404: CONSUMER PROTECTION
Analysis of the effectiveness of consumer protection efforts. Examination of government laws, regulations, and agencies at the federal, state, and local levels, as well as the effectiveness of both business and private consumer protection efforts. (3H,3C)

4414: PROFESSIONALISM IN CONSUMER AFFAIRS
Roles, functions and responsibilities of consumer affairs professionals employed in business, government, and non-profit public/consumer interest organizations.Professional advocacy within employing organizations, managing consumer complaint handling systems and major consumer and career issues are analyzed. (3H,3C)

4504: ADVANCED RESOURCE MANAGEMENT
Theory and principles of the systems approach to resource management. Application to family problems of special life cycle or resource situations. (3H,3C)

4604: HOUSING, ENERGY AND THE ENVIRONMENT
A study of the development and management of sustainable housing, emphasizing energy and environmental resource efficiency. (3H,3C)

4614: ADVANCED RESIDENTIAL TECHNOLOGIES
Residential technologies, such as, their impact on home activities, and how they can be successfully integrated into the house structure and design. Pre: 2614. (3L,3C)

4624: ADVANCED KITCHEN AND BATH DESIGN
Planning, design, and evaluation of residential kitchens and bathrooms, in relation to the total house plan. Emphasis on planning principles and technical requirements with attention to functional use of the spaces to meet the needs of people. Pre: 2614, 3624. (3H,3C)

4634: HOUSING AND SOCIETY
Economic and social importance of housing as a community concern within the United States, as well as the role of the government and profit/non-profit sectors. The need for public policy on housing in the context of different cultural perspectives of home, and the social issues that impact the

community's supply of safe and affordable housing. Junior standing required. (3H,3C)

4664: UNIVERSAL DESIGN
Evaluation and design of commercial and residential environments with consideration for accessibility, adaptation, safety, and support of the user(s). (2H,2C)

4674: MANAGING AND MARKETING HOUSING FOR LATER LIFE
Managing and marketing housing for later life, including active adult communities and assisted living facilities. Pre: (2675 or 3675), (2676 or 3676). (2H,2C)

4684: ADVANCED PROPERTY MANAGEMENT
Property management considerations associated with condominiums, cooperatives, office and retail space as they relate to leases and negotiations, maintenance and marketing practices, and legal and fiduciary responsibilities of the property manager; and use of computer-assisted property management software. (3H,3C)

4694: CONTEMPORARY ISSUES IN PROPERTY MANAGEMENT
Issues affecting property management, including ethics, professional management decisions, legislative issues, and current management practices. The course culminates in the analysis of an apartment community and development of a management plan. Pre: 4694 and senior standing in the Residential Property Management option or 5964 and graduate standing. Pre: 4964 or 5964. (3H,3C)

4964: FIELD STUDY
Variable credit course. X-grade allowed.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

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Liberal Arts and Human Sciences

Army ROTC

www.armyrotc.vt.edu/

Michael I. Bumgarner, Col., U.S. Army, Head
Professor: Michael I. Bumgarner
Assistant Professors: K. Joyce; D. Adkins, E. Downs; A. Jones
Advisor: 231-6401

Overview

The Department of Military Science provides a program of leadership development which prepares college men and women for service as officers in the United States Army. After graduation, they serve as commissioned officers on active duty, or as officers in reserve forces units.

To accomplish this, the department:

- Prepares cadets to be commissioned as Second Lieutenants through a curriculum which develops leadership and management skills, and provides opportunities to utilize these skills in a variety of practical applications.
- Provides an understanding of how to lead and influence small organizations, with a strong emphasis on personal integrity, ethical decision making, goal setting, and mission accomplishment.
- Offers adventure training, such as rappelling, land-navigation, marksmanship, and, for selected students, airborne, air assault, combat diver training and the opportunity to serve with active army units worldwide during the summer.
- In conjunction with the Virginia Tech Corps of Cadets, provides programs and experiences which increase self-confidence, self-discipline, physical stamina, poise, and other attributes essential to the development of a leader of character--one who is prepared to serve the nation or the commonwealth both in or out of uniform.

The curriculum and leader development programs of the Department of Military Science are mentally and physically challenging. Cadets learn individual soldier skills and undergo physical conditioning, beginning in the freshman year. On-campus instruction is done both in the classroom and in the field environment. Field trips expand the general knowledge of cadets and provide opportunities for practical leadership experience. Summer leadership evaluations occur between the junior and senior years at Fort Lewis, Washington.

Army ROTC offers the conventional four-year program where a student enters as a freshman. A three-year program for sophomores is also available. Additionally, a two-year program is offered for juniors and graduate students. Placement credit may be awarded to students with ROTC or JROTC experience, students currently serving in the Army Reserve or National Guard, those who have had active military service, or those who volunteer for summer training at Fort Knox, Kentucky.

Cadets enrolled in the junior and senior years of ROTC are paid a tax-free stipend of $450.00 for ten months during their junior year and $500 for ten months during their senior year for a total of $9,500.00. Applications for these scholarships are available on-line at www.armyrotc.com.

Membership in the Virginia Tech Corps of Cadets is a pre-requisite for all ROTC classes. The cost of cadet uniforms is paid by a special Army uniform allowance provided to each enrolled cadet.

Minor in Leadership Studies

Satisfactory completion of the 20-credit military science curriculum may qualify each cadet for a minor in leadership studies. Virginia Tech is the first land-grant university in the nation to recognize the military science curricula with the award of a leadership studies minor. Contact the Center for Leader Development, 540/231-7136, for information on how to apply for the minor in leadership studies.

Undergraduate Courses (MS)

1005,1006: MS I, AROTC
First year of military science. 1005: Introduction to ROTC. Roles and mission of the Army, including the Army National Guard and Army Reserve. Army customs and traditions. Introduction to drill ceremony, basic first aid, physical training and land navigation. Required participation: leadership lab, physical training and field training exercises. 1006: Basic military skills training. Introduction to marksmanship, small unit tactics and leadership. Required participation: leadership lab, physical training and weekend field training exercises. I (1H,2L,2C)

2005,2006: MS II, AROTC
Second year of military science. 2005: Apply ethics-based leadership skills. Oral presentations, writing concisely, basic military tactics, advanced first aid and land navigation. Required participation; leadership lab, physical training, weekend field exercises. 2006: Team and small unit operations to include radio communications, safety assessments, movement techniques. Required participation: leadership lab and weekend field training exercises. I Pre: 1005, 1006. (1H,2L,2C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3005,3006: MS III, AROTC
Third year of military science. 3005: Analysis of the leadership role in directing and coordinating offensive and defensive tactical operations. Introduction to military training management. Practical exercises in land navigation and small unit tactics. 3006: Classroom and practical exercises to prepare cadets for Advanced Camp: emphasis on weapons qualification, physical fitness, leadership techniques, and small unit operations. Practical exercises to enhance oral and written skills. I Pre: 1005, 1006, 2005, 2006. (3H,2L,3C)

4005,4006: MS IV, AROTC
Fourth year of military science. 4005: The role of the military profession in today's society. Ethical dimensions of military decision-making. Introduction to methods of instruction, the conduct of briefings, how to structure and conduct meetings, performance and disciplinary counseling. 4006: Introduction to logistics, personnel management, the Army finance and accounting system, the role of the lieutenant in unit administration and military justice. The military aspect of world geography. Current events and their relevance to the military profession. I Pre: 3005, 3006. (3H,2L,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

TOP

Liberal Arts and Human Sciences

Communication

www.comm.vt.edu/

Robert E. Denton, Jr. , Head
Assistant Head and Director of Undergraduate Programs: Marlene M. Preston
Director of Graduate Studies: Beth M. Waggenspack
W. Thomas Rice Chair: Robert E. Denton, Jr.
Professors: R. E. Denton, Jr.; W. W. Hopkins; S. G. Riley
Associate Professors: R. L. Holloway; J. A. Kuypers; M. M. Preston; J. C. Tedesco; B. M. Waggenspack
Assistant Professors: Y. Chen; J. D. Ivory; J. B. Mackay; R. M. Magee; D. M. Waymer; A. P. Williams
Advanced Instructors: D. M. Jenkins; E. W. Stallings
Instructors: D. Aguilar Booth; K. Garland; E. Kanter; R. L. Lazenby; B. Quesenberry; E. L. Tydings; D. H. Young
Associate Professor Emeritus: E. H. Sewell, Jr.

Overview

The major in communication, leading to a B.A., allows students to develop a broad understanding of the discipline and specific expertise in either public communication or mass communication. The Department of Communication focuses on strategic, theoretical, and practical application of message creation, delivery, analysis, and criticism in cultural and historical contexts.

Communication majors are prepared to continue their studies in graduate school or immediately apply their skills in various professional settings because of the broad applicability of both the theory to which they are exposed and the competencies they develop. Rooted in a strong liberal arts curriculum, this course of study prepares students to enter careers in mass media, business, public service, government, or professional specializations, such as law.

Options

Students choose one of four options in COMM in order to specialize in the discipline (effective for students graduating in calendar year 2011). Two options involve the study of public communication: Public Relations and Communication Studies. The other option involves the study of mass communication: Electronic and Print Journalism.

Public Relations –This option emphasizes both skill and management functions of public relations through theoretical and practical applications. Public relations spans media, organizational, corporate, and political contexts and includes investigation and analysis of public relations situations (e.g., crises, successes), message production and campaign planning, writing and presentation, and evaluation of public relations strategies. Public relations permeates many areas of corporate, non-profit, and political careers, so this option provides students a foundation for many different career paths.

Electronic and Print Journalism -- This option prepares students for news media careers in newspapers, magazines, broadcasting and new media. The lines that separate these specialties are blurring as media convergence becomes more nearly the norm. Courses provide both practical skills and theory covering history, law and ethics, current controversies and opportunities in the changing news media.

Communication Studies -- This option is designed to provide students with a broad overview of communication theories and practices, stressing understanding and effective participation in communication across interpersonal, organizational, and public contexts. For students interested in fields such as politics, law, education, business, ministry, or medicine, the Communication Studies option could be especially appealing because of its analytical and critical approach to communication.

Cinema Studies - Cinema is a key medium of modern mass communication, information-dissemination, and entertainment. It is at once a business, an industry, a means of creative expression, and a social and political force. Students in this option learn about the history of cinema, its aesthetic designs and production methods, its role in modern social and political movements, and its business operations. Students interested in pursuing a cinema career -- as a scholar, teacher or filmmaker -- should choose this option.

Major Requirements

Along with University and College requirements, including CLE and foreign language, majors must complete 42 hours in Communication.

The curriculum is designed to provide foundational experiences, development courses, advanced study, and a capstone experience. Students are introduced to concepts early in the undergraduate career, and the curriculum allows them to build knowledge and skills as they work on increasingly complex tasks. They also develop skills in written, spoken, and visual communication across their studies in the major. At the foundational level, students in every option are required to take the same introductory courses. Then students move into one of three options, and later they come back together in the senior year to work on a capstone experience.

Public Relations:

1. Foundation: COMM 1014, COMM 1015, COMM 1016
2. Development: Varies by option; see checksheet
3. Advanced Study: Varies by option; see checksheet
4. Capstone: Choose 1: COMM 4214, 4224, 4244, 4254, 4304, 4344

Electronic and Print Journalism:

1. Foundation: COMM 1014, COMM 1015, COMM 1016
2. Development: Varies by option; see checksheet
3. Advanced Study: Varies by option; see checksheet
4. Capstone: Choose 1: COMM 4214, 4224, 4244, 4254, 4304, 4344

Communication Studies:

1. Foundation: COMM 1014, COMM 1015, COMM 1016
2. Development: Varies by option; see checksheet
3. Advanced Study: Varies by option; see checksheet
4. Capstone: Choose 1: COMM 4214, 4224, 4244, 4254, 4304, 4344

Cinema Studies:

1. Foundation: COMM 1014, COMM 1015, COMM 1016
2. Development: Varies by option; see checksheet
3. Advanced Study: Varies by option; see checksheet
4. Capstone: Choose 1: COMM 4214, 4224, 4244, 4254, 4304, 4344

Satisfactory Progress Toward the Degree

University policy requires that students demonstrate their progress toward the degree by meeting minimum requirements. A student will be certified as making satisfactory progress towards a degree by meeting the following requirements:

1. Option: Declared no later than the semester during which the 45th hour (overall) is completed
2. Courses: COMM 1014 (minimum grade of C); COMM 2124 by end of semester in which the 60th hour is attempted
3. Overall GPA: 2.5 by the time 45 hours have been attempted; 3.0 for students double-majoring with COMM secondary
4. COMM GPA: 2.0 or better by the semester the 75th hour is completed

Students who fall below the standard for either the overall GPA or the COMM GPA will have one semester to regain the required GPA standards. A student who fails to make satisfactory progress toward degree after that semester will be blocked from continuing in the Communication major.

Internal Transfers into Communication

Students enrolled in other Virginia Tech majors who wish to transfer into Communication must submit an application. Criteria and application forms are available at the Department website: www.comm.vt.edu

Undergraduate Courses (COMM)

1014: INTRODUCTION TO COMMUNICATION STUDIES
Survey of the field of communication studies from the interpersonal to the mass communication levels; emphasis on development of theories and concepts, social contexts, and message analysis. (3H,3C)

1015-1016: COMMUNICATION SKILLS

Introduction to oral and written communication. 1015: Focus on oral and written communication in interpersonal, small group, and public contexts. Special emphasis on the writing process, listening, interviewing, conflict resolution, critical analysis, and communication through electronic media. 1016: Continued Study in written and oral communication skills for small group and public contexts. Focus on practical applications in research and information gathering, audience analysis and adaptation, message development, and oral and written presentations. May not receive credit for both 1015-1016 and 2004. (3H,3C)

2004: PUBLIC SPEAKING
Basic skills of public speaking; speech organization and delivery; emphasis on in-class delivery of speeches. Credit may not be earned for both Comm 2004 and Comm 2014. Sophomore standing required. (3H,3C)

2014: SPEECH COMMUNICATION
Study of speech communication emphasizing the organization and delivery of messages based on audience analysis; examination of messages in the public, small group, and organizational contexts; emphasis is on theory applied to the delivery of speeches. Credit may not be earned for both Comm 2004 and 2014. Sophomore standing required. Pre: 1014, 1024. (3H,3C)

2024: MEDIA WRITING
Writing and information gathering skills including news, features, press releases, and advertising copy for broadcast, print and public relations media. This is a writing intensive (WI) course. Pre: 1014. (3H,3C)

2034: VISUAL MEDIA
An introduction to the visual image and visual thinking applied to photography, video, and film. Sophomore standing required. Pre: 1014. (3H,3C)

2044: PRINCIPLES OF PUBLIC RELATIONS
Principles of public relations practice; public relations in organizations; responsibilities of the public relations practitioner; legal and ethical considerations; role of public relations in society. Sophomore standing required. Pre: 1014. (3H,3C)

2054 (TA 2054): INTRODUCTION TO FILM
Introduction to film as a medium for artistic communication. Sophomore standing required. X-grade allowed. (2H,3L,3C)

2064: THE RHETORICAL TRADITION
Great theories of rhetoric developed throughout the world during the past 2,500 years will be analyzed to demonstrate the dynamic, critical nature of persuasive thought. (3H,3C)

2074: INTRODUCTION TO MASS COMMUNICATION
Introduction to the history of and operation of the mass media in society, including the structure of mass media institutions, the process and effects of mass communication and the law and regulations that apply to mass communication. Does not count for Communication Studies major. Pre: Sophomore standing. (3H,3C)

2084: MEDIA INSTITUTIONS
Historical development, current industrial structure, and recent trends of different media institutions including print, film and electronic media. Emphasis on how economic incentives influence media content and the interconnections between media institutions. (3H,3C)

2094: COMM INTERNET & SOCIETY
This course examines the Internet as an emerging mass communication medium and its potential impact on society. Topics to be discussed include computer-mediated communication, emergence of on-line community, privacy in the information age, copyright, freedom of speech, antitrust, and electronic commerce. Students will also learn basic technical concepts of the Internet and software skills to create a web site. Pre: 1014. (3H,3C)

2104 (AINS 2104) (HUM 2104): ORAL TRADITIONS AND CULTURE
Examination of the world's great oral traditions, both ancient and contemporary. Emphasis on performance contexts, relationships among multicultural traditions, including American Indian oral traditions, and the relationships among orality, literacy, technology, media, and culture. I (3H,3C)

2124: INTRODUCTION TO COMMUNICATION RESEARCH
Study of approaches to research in the discipline, including identification and analysis of existing research; procedures for conducting and reporting basic research in communication. Pre: 1014, (1016 or ENGL 1106). (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3024: MASS MEDIA HISTORY
History of the development of mass media from early writing systems through new technologies; emphasis on print and broadcast media in the United States. Pre: 1014. (3H,3C)

3034 (HUM 3034): THEORIES OF POPULAR CULTURE
Relationship of popular culture to communication; ways to classify, analyze, and evaluate popular culture; history of main themes with emphasis on the United States; cultural evolution of the electronic revolution. Junior standing required. I (3H,3C)

3054 (TA 3054): AMERICAN FILM GENRES
Close visual and cultural study of classic film genres. Emphasis is on the cinematic codes and narrative conventions which unify the genre and

which are found in representative films. Exploration of genre films as symbols of American culture and society. Genres studied include the Western, the musical and the detective film. Pre: 2054. (3H,3C)

3064: PERSUASION
Theoretical foundations of persuasion; techniques of persuasion; contemporary persuasive practice and campaigns; persuasive media strategies. Junior standing required. Pre: 1016 or ENGL 1106. (3H,3C)

3104: VIDEO PRODUCTION: FIELD
Basic elements, theories, and practices of video productions, including photography and editing. Students will develop skills in production through operation of portable field equipment and computer editing systems. Junior standing. Pre: 2034. (2H,3L,3C)

3114: VIDEO PRODUCTION: STUDIO
Producing, directing, and writing live video segments; operating control room and studio equipment including studio camera, video switcher, audio board and the creation of video graphics and written packages. Pre: (3104 or 3184), 3174. (2H,3L,3C)

3124: INTERPERSONAL COMMUNICATION
Basic theories and processes of person-to-person communication; interpersonal perception; verbal and nonverbal communication; establishment of relationships in the family and work situation. Junior standing required. (3H,3C)

3134: ARGUMENTATION AND DECISION-MAKING
Practical reasoning and argumentation about questions of community significance, emphasizing critical thought, rhetorical strategies, and advocacy. Junior standing required. Pre: 2004 or 1016. (3H,3C)

3144: WRITING AND EDITING FOR PUBLIC RELATIONS
Advanced writing and editing skills related to the preparation of press releases, feature articles, brochures, newsletters, fund-raising letters, annual reports, and webpages. Pre: Junior standing. Pre: 2024. (3H,3C)

3154: REPORTING
News gathering, news writing, and news judgment; development of news sources; establishing a news beat on campus. Junior standing required. Pre: 2024. (3H,3C)

3164: GROUP PROCESSES AND PRESENTATIONS
Study of group theory and its application to a group project, including team dynamics and leadership, conflict resolution, project management, and team presentation strategies. (1H,1C)

3174: BROADCAST WRITING
Writing for radio and television; techniques of broadcast interviewing; writing commercials, news, features, and documentary. Junior standing required. (2H,3L,3C)

3194 (TA 3194): DIGITAL CINEMA PRODUCTION
Basic production techniques, aesthetics, and technology of digital cinema production. Pre: 2054. (2H,2L,3C)

3204 (HUM 3204): MULTICULTURAL COMMUNICATION
Exploration of communication in various cultural groups through the medium of performance. Emphasis on understanding cultural differences and similarities in styles of communication, aesthetics, worldviews, and values. (3H,3C)

3244 (PSCI 3244): POLITICAL COMMUNICATION
Distribution of political information; elite-mass communication; alternative models of political communication; communication and telecommunications policy. Pre: PSCI 1014 or PSCI 1024. (3H,3C)

3544 (ENGL 3544): LITERATURE AND FILM
Works of literature and the films into which they have been transformed; emphasis on differences between media. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

3984: SPECIAL STUDY
Variable credit course.

4014: MEDIA EFFECTS
Impact of mass media on individuals and on society; methods for documentation of media effects; research about effects on various demographic groups such as children, elderly, and minorities; effects of advertising; effects of interactive and time shift technologies. Senior standing required. (3H,3C)

4024: COMMUNICATIONS LAW AND ETHICS
Freedom of speech and press; how this freedom is limited in such areas as libel, privacy, copyright, contempt, free press/fair trial, judicial gag orders, reporters' shield laws; related ethical areas. Senior standing required. (3H,3C)

4034 (HUM 4034): FUNCTIONS OF POPULAR CULTURE
Popular culture as a humanistic discipline; emphasis on archetypes, formulas, and genres; the function of ideas, images, and icons on the popular imagination. Senior standing required. (3H,3C)

4044 (IS 4044): INTERNATIONAL COMMUNICATION
Comparative perspectives on global communication systems; problems with the flow of information; roles of international organizations; mass communication and national development; implications for conflict resolution; selected case studies. Senior standing required. (3H,3C)

4054: PUBLIC RELATIONS CASE STUDIES
Case studies applying public relations principles. Senior standing required. Pre: 2044. (3H,3C)

4074: ORGANIZATIONAL COMMUNICATION
Role of communication in complex organizations; communication networks, communication and management, message systems, decision-making; relationships between organizational theory and communication. Senior standing required. (3H,3C)

4084 (TA 4084): FILM HISTORY
Aesthetic, economic, social, and technological history of world cinema; film theory as it relates to the history of cinema. Junior standing required. Pre: 2054. (2H,3L,3C)

4094: BROADCAST MANAGEMENT
Broadcast management procedures; programming; sales and advertising. Senior standing required. Pre: 3184. (3H,3C)

4114: PHOTOJOURNALISM
Interpretive and creative photography applied to journalism; cameras, films, photography techniques; history of photography as communication; advanced darkroom techniques. Junior standing required. Pre: 2034. (3H,3C)

4124: ADVANCED REPORTING
Gathering and writing complex news and interpretative stories; emphasis on covering courts, governmental agencies, economic issues, consumer issues, and environmental issues; use of sources including human and data-base. Pre: 3154.(3H,3C)

4134: EDITORIAL WRITING
Development and function of the editorial page; writing of editorials, reviews, and personal columns; examination of role of letters and syndicated columns and cartoons; problems editorial writers face in their jobs and communities. Junior standing required. (3H,3C)

4144: MAGAZINE WRITING
The writing of feature material (as opposed to the reporting of hard news), plus detailed examination of several article types from a wide variety of contemporary magazines and newspapers. Junior standing required. Pre: 2024. (3H,3C)

4154: ELECTRONIC NEWS GATHERING
Production of television news programs. Elements of reporting, writing, performance, production, direction, editing, news management, videography, and executive producing. May be repeated for credit up to a maximum of 6 credit hours with different content. Pre: 3174, 3184. (1H,6L,3C)

4204: COMMUNICATION INTERNSHIP
Placement in a communication industry for practical internship under supervision by a departmental advisor and a professional in the field. May be repeated for credit up to a maximum of 6 hours credit. Junior standing and consent required. Pass/Fail only. Variable credit course.

4214: TOPICS IN COMMUNICATION RESEARCH
Selected topics in communication research. Offered on demand. Senior standing or consent required. (3H,3C)

4224: TOPICS IN MEDIA CRITICISM
Selected topics in media criticism. Offered on demand. Senior standing and consent required. (3H,3C)

4244: TOPICS IN PUBLIC COMMUNICATION
Selected topics in public communication. Offered on demand. Senior standing and consent required. (3H,3C)

4254: TOPICS IN MEDIA WRITING
Selected topics in media writing; emphasis on critical analysis and writing. Senior standing required. (3H,3C)

4294 (TA 4294): WRITING AND DIRECTING FOR DIGITAL CINEMA
Advanced course in digital cinema production exploring the practice of writing, producing, and directing dramatic motion pictures. Pre: 3194. (2H,2L,3C)

4304: COMMUNICATION CAMPAIGNS
Selected topics in communication campaigns; emphasis on application of theory in campaign contexts. Senior standing required. Pre: 2044 or 3064. Co: CS 3164.
(3H,3C)

4344 (TA 4344): ADVANCED TOPICS IN FILM
Selected topics in advanced film studies; emphasis on critical analysis and application. May be repeated for credit up to a maximum of 6 credit hours with different content. Pre: 2054. (3H,1L,3C)

4354 (TA 4354): THE FILM DIRECTOR
Close thematic and visual analysis of the films of a single director. Directorial style assessed in terms of recurring visual and thematic patterns. Development and evolution of the director's style, and comparison with filmmakers whose work lacks a unifying "signature." Directors studied include Alfred Hitchcock, Charlie Chaplin, and Orson Wells. Taught alternate years. Pre: 2054. (3H,3C)

4364: ISSUE MANAGEMENT IN PUBLIC RELATIONS
Principles of issue management: creation, development, and resolution; role of rhetoric in public policy processes; legal constraints; strategies; social responsibility. Pre: 2044. (3H,3C)

4374: NEW COMMUNICATIONS TECHNOLOGY
Identify recent trends in the innovation of new communications technologies; storage, transmission, and display systems of mediated communication: optical disc, common carriers, telecommunication-computer linkages, high-definition TV, and virtual reality; information industries and society; markets for new and existing telecommunication services. Junior or senior standing required. (3H,3C)

4384: CRITICISM OF PUBLIC COMMUNICATION
Study of rhetorical research method as systematic approach to the analysis, interpretation, and evaluation of public communication texts including speeches, film, and advertisements. Pre: 2064. (3H,3C)

4394 (TA 4394): ADVANCED CINEMA PRODUCTION
Advanced cinema course in motion picture lighting, editing theories and digital post-production techniques. Pre: 3194. (2H,2L,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences

English

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Nancy Metz, Associate Chair
Cheryl Ruggiero, Assistant Chair
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Alumni Distinguished Professor: L. H. Roy
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Associate Professors: K. Belanger; E. Brumberger; A. J. Colaianne; J. H. Collier; C. Dannenberg; J. Dubinsky; S. Fowler; P. Heilker; R. Hicok; S. M. Knapp; J. Mann; N. A. Metz; K. M. Powell; K. Swenson; D. M. Welch
Assistant Professors: S. Carter-Tod; G. Chandler; C. Evia; J. Koslow; E. Meitner; K. E. Pender; S. Salaita
Instructors: R. Allnutt; M. Armstrong; C. Bean; M. Bliss; E. Bloomer; R. Canter; Z. K. Combiths; K. Fallon; S. Frost; K. Graham; S. Hagedorn; J. Harvill; S. Kark; A. F. Kinder; J. Lawrence; V. LeCorre; A. LoMascolo; S. Martin; J. Mengert; J. Mooney; S. Mooney; M. D. Moore; A. Murphy; L. Neilan; S. Oakey; H. R. Patton; R. M. Piersol; S. Reisinger; C. Ruggiero; S. Saffle; J. Scallorns; L. Skinner; M. S. Smith; J. M. Vollmer; G. Voros; E. Weathers; J. Wemhoenerr
Visiting Assistant Professor: C. Eska
Career Advisor: L. Skinner (231-6175)

Overview

The curriculum in English offers excellent preparation for students who seek careers in business, government, and non-profit organizations, who are preparing for graduate or professional schools, who plan to teach, and who are seeking careers that involve writing.

The English Major

The major in English is composed of an in-major core of 16 hours and a number of upper-division options ranging from 30 to 37 hours (including 12 hours of English electives). A required one-hour corequisite course at the sophomore level introduces students to the the major.

After completion of the in-major core, the English major offers three options for specialization: Literature, Language, and Culture, Professional Writing, and Creative Writing. Students who choose the Literature, Language, and Culture option will select one of the following tracks: Literature, Cultural Studies, Pre-Education, or Pre-Law.

The In-Major Core:
All English majors must take 16 hours distributed as follows.

- 3 hours: Introduction to Critical Reading (2604). This is the gateway course to the major and should be taken immediately after satisfaction of the first-year writing requirement
- 1 hour: Introduction to English Studies (2614). This co-requisite course should be taken in the same semester as 2604.
- 6 hours: Survey of British Literature (2515, 2516).

- 3 hours: Survey of American Literature (2525 or 2526).
- 3 hours: Shakespeare (4165 or 4166).

Upper-Division Options

In order to enroll in an upper-division option, a student must:

- Pass 2604 with a minimum grade of C.
- Complete 12 of the 16 hours in the in-major core with a GPA of 2.0 or better.

Literature, Language, & Culture Option

The Literature, Language, & Culture (LLC) Option of the major is aimed at those students who are interested in the study of literature and its many contexts and who want to pursue careers in such areas as the law, business, government, publishing, advertising, social services, and education. There are four different tracks in the LLC Option: the Literature Track, the Cultural Studies Track, the Pre-Education Track, and the Pre-Law Track.

We have known for centuries that the study of literature, language, and culture is matchless in preparing students for a lifetime of reading, analysis, self-discovery, and self-expression. Each of the four LLC choices grounds students in the sophisticated thought and analysis of literary studies, then focuses them upon a track that will take them more deeply into literary studies, more broadly into cultural studies, or into the specific preparations for careers in education or law. In addition to the in-major core requirements (16 hours), each track has its own unique emphasis and requirements.

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The Literature Track

This choice allows students the maximum of time devoted to the various periods, genres, themes, major figures, and practices distinctive to region, ethnicity, or gender; students will not only finish their degrees with a rich sense of the best that has been thought and said, but they will also be skilled in the art of analyzing any text or body of data and in presenting their analyses persuasively and insightfully.

The B.A. in English, LLC Option/Literature Track, requires 33 hours in English beyond the in-major core; these 33 hours are distributed as following: to fulfill the period or author requirements detailed below, the student must take one of the following courses which cover pre-1800 literature: 3204, 3214, 3224, 4114, 4124, 4214, 4554, or an appropriate section of 3254:

- 3 hours: A backgrounds course chosen from the following: Ancient Greek & Roman Mythology (CLA 2444); Literary and Cultural Criticism (3354); The Bible As Literature (3584); Hebrew Bible/Old Testament (REL 2414); New Testament (REL 2424).
- 3 hours: A period course chosen from the following: Medieval Literature (3204); Renaissance Literature (3214); Augustan Literature (3224); Romantic Literature (3234); Victorian Literature (3244); American Literature before 1900 (3254); Modernist British Literature (3264); Modernist American Literature (3274); Introduction to Old English (4124); British Drama Before 1800 (4554).
- 3 hours: An author course chosen from the following: Chaucer (4114); Shakespeare I (4165); Shakespeare II (4166); Milton (4214); Studies in a British Author after 1800 (4624); Studies in an American Author before 1900 (4634); Studies in an American Author after 1900 (4644). The Shakespeare course taken for the in-major core cannot also satisfy the author requirement.
- 3 hours: A course in prose narrative chosen from the following: English Novel I (4405); English Novel II (4406); American Narrative to 1950, I (4415); American Narrative to 1950, II (4416); Contemporary Fiction (4664).
- 3 hours: A course in non-canonical literature chosen from the following: Topics in Literature by Women (3364); Literature for Children (3524); Ethnic Literature for Children (3514); African-American Literature (3634); Postcolonial Cultural Studies (3644); Ethnic American Literature (3654).
- 3 hours: Senior Seminar (4784). The capstone course for the LLC Option/Literature Track
- 15 hours: Five English elective courses; at least six hours must be at the 4000-level, and no more than three hours can be below the 3000-level.

For the most up-to-date information, please consult the LLC web pages (http://www.english.vt.edu/undergraduate/LLC).

TOP

The Cultural Studies Track

This choice prompts students to correlate what they have learned about literary analysis with what they find when they pay that kind of close attention to the full range of cultural artifacts and practices all around us; they will finish their degree with an acute sense of how culture and society work through the various forms by which we shape our lives and identities, not to mention a well-honed skill in persuading others of their insights.

The B.A. in English, LLC Option/Cultural Studies Track, requires 33 hours in English beyond the in-major core.

- 6 hours: Two courses in literary and cultural criticism: Literary and Cultural Criticism (3354) and Cultural Studies Theory and Practice (4024).
- 9 hours, chosen from among the following: Topics in Literature by Women (3364); African-American Literature (3634); Post-colonial Cultural Studies (3644); Ethnic American Literature (3654); Literature and Film (3544); Studies in Contemporary Culture (4674); Literature, Medicine, and Culture (3154); Language and Society (4044)
- 3 hours: Senior Seminar (4784). The capstone course for the LLC Option/Cultural Studies Track.
- 15 hours: Five English elective courses; at least six hours must be at the 4000 level, and no more than three hours can be below the 3000 level. Students in the Cultural Studies track are encouraged, but not required, to take the following courses among their free electives in English: ENGL 3514: Ethnic Literature for Children; ENGL 3524: Literature for Children; ENGL 3534: Literature and Ecology; ENGL 3654: Ethnic American Literature; ENGL 4424: Digital Literary Culture.

For the most up-to-date information, please consult the LLC web pages (http://www.english.vt.edu/undergraduate/LLC).

The Pre-Education Track

This track will provide students with a thorough grounding in canonical American and British literature and hone their skills in literary analysis, but it will also ensure that they become conversant with content areas required by the Virginia state licensing board: literature written by minorities and women, linguistics, and sociolinguistics. Pursuit of this track is the best possible way to prepare for the graduate work leading to certification

The B.A. in English, LLC Option/Pre-Education Track, requires 36 hours in English beyond the in-major core. Those 36 hours are distributed as follows:

- 3 hours: A 3000–4000-level course in women's literature chosen from among the following: Topics in Literature by Women (3364); an appropriate section of British Author after 1800 (4624); an appropriate section of American Author before 1900 (4634); an appropriate section of American Author after 1900 (4644).
- 3 hours: A 3000-4000 level course in literature by a minority chosen from among the following: African-American Literature (3634); Ethnic Literature for Children (3514); Ethnic American Literature (3654); an appropriate section of British Author after 1800 (4624); an appropriate section of American Author before 1900 (4634); an appropriate section of American Author after 1900 (4644).
- 3 hours: A 3000 or 4000-level writing course chosen from among the following: Introduction to Professional Writing (3104); Advanced Composition (3754); Technical Writing (3764); Business Writing (3774); Science Writing (4824).
- 3 hours: A period or author course chosen from among the following: Medieval Literature (3204); Renaissance Literature (3214); Augustan Literature (3224); Romantic Literature (3234); Victorian Literature (3244); American Literature before 1900 (3254); Modernist British Literature (3264); Modernist American Literature (3274); Introduction to Old English (4124); British Drama Before 1800 (4554); Chaucer (4114); Shakespeare I (4165); Shakespeare II (4166); Milton (4214); Studies in a British Author after 1800 (4624); Studies in an American Author before 1900 (4634); Studies in an American Author after 1900 (4644). The Shakespeare course taken for the in-major core cannot also satisfy this requirement.
- 3 hours: Modern English Linguistics (4064).
- 3 hours: Language and Society (4044).
- 3 hours: Senior Seminar (4784). The capstone course for the LLC Option/Pre-Education Track.
- 15 hours: Five English elective courses (15 hours); at least six hours must be at the 4000 level, and no more than three hours can be below the 3000 level.

In addition to these specific course requirements, LLC/Pre-Education majors who plan careers in elementary or middle school education should consider using their electives to take the following courses: Introduction to World Literature (1644); Literature for Children (3524); and either History of the English Language (4054) or English Syntax (4074).

For the most up-to-date information, please consult the LLC web pages (http://www.english.vt.edu/undergraduate/LLC).

TOP

The Pre-Law Track

This choice is the ideal preparation for the study and practice of the field of law; students will finish their degree with significant advantages as readers and analysts of the law archives that they must master in their graduate training, and also as masters of the art of presentation in the briefs and oral presentations that constitute the bulk of a legal career.

The B.A. in English, LLC Option/Pre-Law Track, requires 33 hours in English beyond the in-major core and 15 hours in application areas. These 33 hours are distributed as follows:

- 3 hours: A period course chosen from the following: Introduction to Old English (4124); Medieval Literature (3204); Renaissance Literature (3214); British Drama Before 1800 (4554); Augustan Literature (3224); Romantic Literature (3234); Victorian Literature

(3244); American Literature before 1900 (3254); Modernist British Literature (3264); Modernist American Literature (3274).
- 3 hours: Literature and the Law (3684).
- 3 hours: A 3000–4000 level writing course chosen from among the following: Professional Writing (3104); Advanced Composition (3754); Technical Writing (3764); Business Writing (3774); Science Writing (4824).
- 3 hours: An author course chosen from the following: Chaucer (4114); Shakespeare I (4165); Shakespeare II (4166); Milton (4214); British Author after 1800 (4624); American Author before 1900 (4634); American Author after 1900 (4644). The Shakespeare course taken for the in-major core cannot also satisfy the author requirement.
- 3 hours: A course in narrative chosen from the following: English Novel I (4405); English Novel II (4406); American Narrative to 1950, I (4415); American Narrative to 1950, II (4416); Contemporary Fiction (4664).
- 3 hours: A course in non-canonical literature chosen from the following: Topics in Literature by Women (3364); Literature for Children (3524); Ethnic Literature for Children (3514); African-American Literature (3634); Postcolonial Cultural Studies (3644); Ethnic American Literature (3654).
- 3 hours: Issues in Professional and Public Discourse (4874). The capstone course for the LLC Option/Pre-Law Track.
- 12 hours: Four English elective courses; at least six hours must be at the 4000 level, and no more than three hours can be below the 3000 level.
- 15 hours: Five application area courses distributed across at least three of the following five areas; no more than 6 hours from any one area:
  Business/Economics: ACIS 2004, 2115, 2116; ECON 2005, 2006, 4014, 4214, 4894; FIN 3055, 3104, 4014
  History: 1004, 1115, 1116, 2104H, 2155, 2156, 3014, 3024, 3084, 3105, 3106, 3114, 3175, 3176, 3184
  Philosophy: 1304, 2304, 3314, 4304, 4324, 4334
  Sociology: 3414, 3424, 4404
  Political Science: 1014, 1024, 3334, 3345, 3346.

For the most up-to-date information, please consult the LLC web pages (http://www.english.vt.edu/undergraduate/LLC).

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Professional Writing Option

The Professional Writing (PW) Option of the major is aimed at those students who want to make writing a career. Students combine coursework on the methods, forms, and issues of workplace writing with practical experience, usually in the form of client or service-learning projects with non-profit organizations. As a result, students begin their careers with the writing skills needed to succeed in today's competitive market, an understanding of professional expectations, experience with current software packages, and a portfolio of real-world writing samples.

The B.A. in English, PW Option, requires 46 hours. The 30 hours in English beyond the in-major core are distributed as follows:

- 3 hours: Introduction to Professional Writing (3104).
- 3 hours: Technical Editing and Style (3804).
- 3 hours: A course in linguistics chosen from the following: Language and Society (4044); English Syntax (4074).
- 12 hours: At least 6 hours at 4000-level: Professional Writing electives chosen from the following: Creating User Documentation (3814); Designing Documents for Print (3824); Intercultural Issues in Professional Writing (3834); Grant Proposals and Reports (4804); Writing for the Web (4814); Science Writing (4824); Internship [Professional Writing Focus] (4964). ENGL 3104 and 3804 are pre-requisites for most PW electives.
- 3 hours: Issues in Professional and Public Discourse (4874). The capstone course for the PW Option.
- 6 hours: Two English elective courses from 3000-4000 level courses.

For updated information, please consult the Professional Writing web pages (http://www.english/vt.edu/undergraduate/PW/).

TOP

Creative Writing Option

The Creative Writing (CW) Option of the major is aimed at those students who want to pursue a career as a writer of poetry, fiction, creative non-fiction, or drama. Admission to a Master of Fine Arts (M.F.A.) program is typically based upon writing samples, recommendations, academic history, and -- increasingly -- publications; therefore, students interested in pursuing the M.F.A. should concentrate upon developing an excellent portfolio of poetry, fiction, creative non-fiction, and/or drama. Students interested in M.A. or Ph.D. programs in creative writing, as well as those who plan to enter the fields of publishing and/or editing, should also follow these guidelines. In addition to courses in creative writing, students are well advised to take a range of courses in literature, particularly those in their primary genre(s), in order to familiarize themselves with major writers and literary traditions.

The B.A. in English, CW Option, requires 52 hours. The 36 hours in English beyond the in-major core are distributed as follows:

- 3 hours: Introduction to Creative Writing (2744).

- 3 hours: A backgrounds course chosen from the following: Ancient Greek Roman Mythology (2444); The Bible As Literature (3584); Hebrew Bible/Old Testament (REL 2414); New Testament (REL 2424).
- 3 hours: Creative Writing: Fiction (3704).
- 3 hours: Creative Writing: Poetry (3714).
- 3 hours: A 3000-4000 level Creative Writing elective chosen from the following: Playwriting I (3315); Playwriting II (3316); Creative Writing: Creative Non-Fiction (3724); Creative Writing: Fiction for Young People (4724).
- 3 hours: A course in modern or contemporary literature chosen from the following: Modern Poetry (4504); Contemporary Poetry (4514); Modern Drama (4564); Contemporary Fiction (4664).
- 3 hours: A capstone course in the student's primary genre chosen from the following: Advanced Creative Writing: Fiction (4704); Advanced Creative Writing: Poetry (4714)
- 15 hours: Five English elective courses; at least six hours must be at the 4000 level, and no more than three hours can be below the 3000 level. These electives may include 3704, 3714, and 3724, which may each be repeated twice for a total of nine hours.

For the most up to date information, please consult the Creative Writing web pages (http://www.english.vt.edu/undergraduate/cw/index.html).

Minors in English

The department offers four minors in English, each with its own set of courses. Students who complete one of these minors may ask the department to certify completion by means of a letter for their placement file. Students who want further information or advice about minoring in English should consult the Coordinator of Undergraduate Advising in Shanks Hall 329.

Minor in Literature

The Minor in Literature requires 21 hours distributed as follows:

- 3 hours: A course in writing chosen from the following: Introduction to Creative Writing (2744); Literature and Ecology (3534); Advanced Composition (3754); Technical Writing (3764); Business Writing (3774).
- 3 hours: A period course chosen from the following: Medieval Literature (3204); Renaissance Literature (3214); Augustan Literature (3224); Romantic Literature (3234); Victorian Literature (3244); American Literature before 1900 (3254); Modernist British Literature (3264); Modernist American Literature (3274); Introduction to Old English (4124).
- 3 hours: An author course chosen from the following: Chaucer (4114); Shakespeare I (4165); Shakespeare II (4166); Milton (4214); British Author after 1800 (4624); American Author before 1900 (4634); American Author after 1900 (4644).
- 12 hours: Four English elective courses; no more than three hours can be below the 2000 level.

TOP

Minor in Cultural Studies

The Minor in Cultural Studies requires 21 hours distributed as follows:

- 3 hours: Introduction to Critical Reading (2604).
- 6 Hours in theory: Literary and Cultural Criticism (3354) and Cultural Studies Theory and Practice (4024).
- 9 hours chosen from the following: Topics in Literature by Women (3364); African-American Literature (3634); Post-Colonial Studies (3644); Literature and Film (3544); Literature, Medicine, and Culture (3154); Ethnic American Literature (3654); Language and Society (4044); Studies in Contemporary Culture (4674).
- 3 hours in English electives.

Minor in Professional Writing

The Minor in Professional Writing requires 18 hours distributed as follows:

- 3 hours: Introduction to Professional Writing (3104). (If taken before declaration of the minor, Technical Writing (3764) or Business Writing (3774) may substitute.)
- 3 hours: Technical Editing and Style (3804).
- 3 hours: A course in linguistics chosen from the following: Language and Society (4044); English Syntax (4074).
- 9 hours: Three Professional Writing electives chosen from the following: Creating User Documentation (3814); Designing Documents for Print (3824); Intercultural Issues in Professional Writing (3834); Grant Proposal and Reports (4804); Writing for the Web (4814); Science Writing (4824). ENGL 3104 (or substitute) and 3804 are pre-requisites for most electives.

Minor in Creative Writing

The Minor in Creative Writing requires 21 hours distributed as follows:

- 3 hours in the required introductory course: Introduction to Creative Writing (2744)
- 3 hours: A literary survey course chosen from the following: Survey of British Literature (2516): Survey of American Literature (2526).
- 12 hours: Four Creative Writing electives chosen from the following: Playwriting (3315); Playwriting (3316); Creative Writing: Fiction (3704); Creative Writing: Poetry (3714); Creative Writing: Creative Non-Fiction (3724); Creative Writing: Fiction for Young People (4724).
- 3 hours: One course in literature chosen from the following: Literature for Children (3524); Literature and Ecology (3534); Literature and Film (3544); Bible as Literature (3584); Southern Literature (3614); Appalachian Literature (3624); African-American Literature (3634); Contemporary Poetry (4515); Contemporary Fiction (4664).

A GPA of 2.0 or better calculated on the basis of all courses comprising the minor in Creative Writing is required for graduation. 1105, 1106, and H1204 do not count toward satisfaction of the minor.

TOP

Post-Graduate Study

Undergraduate majors interested in pursuing advanced degrees (M.A. or Ph.D.) in English should, with the assistance of their professors and academic advisors, carefully plan their programs of study. It is generally a good idea to take a variety of courses and to fulfill requirements and electives with as many 3000- and 4000-level courses as possible. It is strongly recommended that students planning to undertake post-graduate study acquire a good reading knowledge of a modern and/or a classical foreign language. Getting to know professors and learning as much as possible about the professional elements of the discipline provide excellent preparation for graduate work. For specific advice and information about applying to graduate school, please consult the undergraduate web pages.

First-Year Composition

The Curriculum for Liberal Education requires a two-semester freshman sequence to fulfill Area 1 requirements. ENGL 1105-1106, which the English Department offers as part of its Writing Program, fulfills this Area I Liberal Education requirement. ENGL 1204H may substitute for this sequence for students who qualify for placement in Honors English. ENGL 1105, Introduction to College Composition: Critical Reading, Writing, and Thinking, ENGL 1106, Writing from Research, and ENGL 1204H, Honors English, share a focus on the rhetorical dimensions of writing, speaking, and visual communication, but each is a separate course with distinctive assignments and goals.

Advanced Standing (AS): (ENGL 1105) and granted Advanced Standing on the basis of three scores: SAT Critical Reading, SAT Writing, and Standardized High School Class Rank. Advanced Standing students fulfill their Freshman English requirement with the single advanced course into which they are placed: **ENGL 1106** or **Honors ENGL 1204H**. If Advanced Standing students complete the assigned advanced course at Virginia Tech with a C- or better in the first enrollment, they receive pass/fail credit for ENGL 1105, the course from which they are exempted. Advanced Standing is a placement category for students at Virginia Tech; it is not related to the Advanced Placement (AP) courses offered in high schools or the AP exam offered by the Educational Testing Service (ETS).

Credit from AP, CLEP, and IB exams can fulfill the CLE Area 1 requirement. See "Advanced Placement," "Advanced Standing," and "International Baccalaureate" information in the Admissions section of this catalog.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the Liberal Arts and Human Sciences College Core (see first part of this chapter), and toward the degree in English.

Satisfactory progress toward the B.A. in English requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, and freshman rule), students must have passed 12 of the required 45-51 credits in English.
2. Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.
3. During their senior year, students must submit an outcomes-assessment writing sample. See the Coordinator of Undergraduate Advising in 329 Shanks for details.

TOP

Undergraduate Courses (ENGL)

0014: ORAL COMMUNICATION FOR INTERNATIONAL TEACHING ASSISTANTS For international students taking regular academic loads. Practice in preparing and delivering oral reports in an academic field, as well as advanced pronunciation and aural comprehension exercises for effective classroom communication. Pass/Fail only. X-grade allowed. (3H,1C) I,II.

1105-1106: FRESHMAN ENGLISH
1105: Critical literacy: Introduction to analytical, critical, and interpretive writing and reading of primarily essay-length work; research; intensive practice in writing and revision; fundamentals of oral presentations. 1106: The Writing Project: Continued study in analytical, critical, and interpretive writing; reading of multiple book-length texts; intensive instruction and practice in writing and revision of longer work, including research; experience in oral presentation. (3H,3C)

1204H: HONORS FRESHMAN ENGLISH
Introduction to analytical, critical, and interpretive writing and reading at an advanced level and accelerated pace for students whose test scores and high school work indicate readiness for the Honors level of complexity, responsibility, and initiative; in a single semester, reviews the work of 1105 and focuses on the work of 1106 at the Honors level. Placement by the English Department required. (3H,3C)

1604: INTRODUCTION TO POETRY
This course examines the genre of poetry from the Old English period up to contemporary writers. Emphasis is on close reading and poetic forms and conventions. (3H,3C)

1614: INTRODUCTION TO SHORT FICTION
This course introduces the knowledge and skills required to read and understand short stories and novellas. Readings trace the development of short fiction from the fable and myth to contemporary narrative forms. (3H,3C)

1624: INTRODUCTION TO DETECTIVE FICTION
This course introduces students to classic and modern texts of detective fiction from a variety of historical periods and cultural traditions. (3H,3C)

1634: INTRODUCTION TO SHAKESPEARE
This course introduces Shakespeare's drama and poetry, including at least one modern adaptation of a Shakespearean play (play, novel, movie, opera, etc.). Emphasis will be placed on how to read a play, how to read Shakespearean verse, and how the various genres of Shakespearean drama differ. (3H,3C)

1644: INTRODUCTION TO WORLD LITERATURE
This course examines masterpieces of world literature in translation. Readings will focus upon one or two common themes across places and times. (3H,3C)

1654: INTRODUCTION TO SCIENCE FICTION AND FANTASY
This course introduces a variety of speculative works within the genres of science fiction and fantasy. Attention will be given to the development and principal characteristics of each genre. Emphasis will be placed on the social, cultural, and historical contexts in which specific speculative texts have been produced. (3H,3C)

1664: INTRODUCTION TO WOMEN'S LITERATURE
This introductory course will examine literary and cultural questions raised by women writers throughout history and from different cultural backgrounds. Emphasis will be on women's writing in English, but the course may include some literature in translation. (3H,3C)

1674: INTRODUCTION TO AFRICAN AMERICAN LITERATURE
This course introduces students to some of the major writers of the African American literary tradition from such early poets as Phillis Wheatley to such contemporary novelists as Toni Morrison. The course will situate the literary works within their historical and cultural contexts, but will also emphasize close readings of the texts. (3H,3C)

1684: INTRODUCTION TO DRAMA
This course examines the history, structures, and dynamics of dramatic literature and theatre practice. Classic and contemporary texts from around the world will be read with emphasis on the traditions and influences that have shaped dramatic form. (3H,3C)

1EWL: WAITING LIST FOR ENGLISH 1105
(3H,3C)

1HWLH: WAIT LIST HONORS ENGLISH 1204
(3H,3C)

2444 (CLA 2444) (HUM 2444): ANCIENT GREEK AND ROMAN MYTHOLOGY
Survey of Ancient Greek and Roman mythology and modern interpretations. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (3H,3C)

2454 (CLA 2454) (HUM 2454): ANCIENT GREEK AND LATIN LITERATURE IN ENGLISH TRANSLATION
A variable content course devoted to the study of major works of Ancient Greek and Latin literature in English translation. May be repeated for credit with different content. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (3H,3C)

2515,2516: SURVEY OF BRITISH LITERATURE
A two-course sequence introducing students to the major writers of the British literary tradition; 2515 extends from the medieval period to the death of Alexander Pope in 1744; 2516 continues to the present day. This course provides the literary, historical, and social contexts necessary to comprehend significant developments in poetry, drama, prose fiction, and criticism. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

2525,2526: SURVEY OF AMERICAN LITERATURE
A two-course sequence introducing students to the major writers of the American literary tradition; 2525 extends from the colonial period to 1865; 2526 continues to the present day. This course provides the literary, historical, and social contexts necessary to comprehend significant

developments in poetry, drama, prose fiction, and criticism. Pre: 1106 or 1204H or COMM 1016. (3H,3C)

2604: INTRODUCTION TO CRITICAL READING
A writing intensive introduction to the techniques and theoretical implications of close reading and to the literary genres of poetry, drama, fiction, and, in some sections, non-fiction. The focus is on four primary texts, at least one of which was written before the eighteenth century and one after it, and on criticism of at least one of these. The course emphasizes the analytical skills, basic critical terminology, and conventions of literary criticism essential to advanced English studies. Intended primarily for English majors and minors. Pre: 1106, H1204 or COMM 1016. Co: 2614. (3H,3C)

2614: THE ENGLISH STUDIES ePORTFOLIO
A lecture/lab course in which students are introduced to the concept of the required English Studies ePortfolio, receive coaching in developing it's various components, and develop the software and technology skills necessary to create an entry-level ePortfolio that they will continue to work on during the course of their undergraduate study. In addition to creating the ePortfolio, students learn about the discipline of English Studies and its various areas of specialization. Co: 2604. (1H,3L,2C)

2744: INTRODUCTION TO CREATIVE WRITING
A workshop for beginning writers who want to explore their talents in poetry, drama, and fiction. Pre: 1106. (3H,3C)

2804 (AINS 2804): CONTEMPORARY NATIVE AMERICAN LITERATURES
This course offers a sampling of fiction, poetry, and non-fiction by the most influential American Indian writers since 1970, authors such as Momaday, Silko, Deloria, Welch, Harjo, and Alexie. Students will also learn about those aspects of cosmology and storytelling traditionally shared by all American Indian Nations, as well as about those aspects specific to the individual tribal traditions from which the authors and their characters come. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: INTRODUCTION TO PROFESSIONAL WRITING
This course introduces students to the theory and practice of professional writing and its functions in workplace settings. In this rhetorically-based course, students gain experience with a variety of writing situations, composing documents that solve problems or help readers make decisions. Students learn current conventions and broadly applicable procedures for analyzing the audiences, purposes, and situations of professional writing, and learn strategies for adapting these conventions and procedures to meet the unique demands of each new situation and task. Pre: 1106 or 1204H or COMM 1016. (3H,3C)

3154: LITERATURE, MEDICINE, AND CULTURE
The representation of health and illness in literature and the cultural aspects of medicine as a practice. Pre: 1106 or H1204 or COMM 1016. (3C)

3204: MEDIEVAL LITERATURE
This course presents medieval British literature from ca. 700 to 1500 in its representative modes and defining contexts, including the literary influences of pagan antiquity, the native British (Celtic) tradition, Scandinavian and contemporary continental influences, the Crusades, the Byzantine Empire, and the philosophical traditions of neoplatonism and scholasticism. Specific authors and texts will vary, but will include poetry, prose, and drama. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3214: RENAISSANCE LITERATURE
This course presents Renaissance British literature from 1500-1660 in its representative modes and defining contexts, including the discovery of the Copernican universe and the new world, the rise of Protestantism, the resultant Counter-reformation, the movement from humanism to empiricism, and the institution of Parliamentary democracy. Specific authors and texts will vary, but will include poetry, prose, and drama. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3224: AUGUSTAN LITERATURE
This course presents Restoration and eighteenth-century British literature from 1660 to 1800 in its representative modes and defining contexts, including the expansion of democracy, commerce, and empire, the successes and limitations of Enlightenment philosophy, and the diversification of the literary public to include women, provincial, and laboring writers. Specific authors and texts will vary, but will include poems, essays, plays and novels. Pre: 1106 or 1204 or COMM 1016. (3H,3C)

3234: ROMANTIC LITERATURE
This course presents Romantic literature from the late eighteenth century to 1832 in its representative modes and defining contexts, including the French, American, and Industrial Revolutions, the expansion of the British empire, the rise of the novel, Gothicism, and the intellectual influence of periodical essays. Specific authors and texts will vary, but will include poetry, fictional prose, and non-fictional prose. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3244: VICTORIAN LITERATURE
This course presents Victorian British Literature from 1832 to 1901 in its representative modes and defining contexts, including the development of modern science and the decline of traditional religion, the emergence of the mass reading public, and the glorification of the writer's role as prophet, guide, and culture critic. Specific authors and texts will vary, but will include poems, essays, plays, and novels. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3254: AMERICAN LITERATURE BEFORE 1900
This course presents American literature from before 1900 in its representative modes and defining contexts, including colonization, the founding of the republic, the Civil War, the settlement of the west, American Romanticism, and
American Realism. Specific authors and texts will vary, but will include poetry and fictional and non-fictional prose. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3264: MODERNIST BRITISH LITERATURE
This course presents Modernist British literature from 1918-1945 in its representative modes and defining contexts, including World Wars I and II, the collapse of the British empire, the influence of Darwin, Marx, and Freud, and such literary movements as Modernism, Realism, and Stream of Consciousness. Specific authors and texts will vary, but will include poetry, prose, and drama.
Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3274: MODERNIST AMERICAN LITERATURE
This course presents Modernist American literature from 1918 to 1945 in its representative modes and defining contexts, including World Wars I and II, the Great Depression, and such literary movements as Modernism and Realism. Specific authors and texts will vary, but will include poetry, prose, and drama. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3304 (AINS 3304): THE LANGUAGES OF NATIVE AMERICA
Study of the structures of the native languages of the Americas; their interrelationships; their use in individual speech communities; contact with other languages; the interrelationships of linguistic structure, culture, and thought; their future survival. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3314: WORKING ENGLISH GRAMMAR
This course introduces students to the fundamentals of standard English written grammar. Some attention will also be paid to the use of English grammar for varying purposes. (3H,3C)

3315-3316 (TA 3315-3316): PLAYWRITING
A workshop course in the craft and art of playwriting which emphasizes the development of craft and the nurturing of vision and art. 3315: primary focus is on the writing of original scripts with additional attention paid to the work of influential playwrights and critics. 3316: primary focus is on the creative process of developing a play with the collaborative influences of a director, actors, designers, and other theatre professionals. Consent of instructor required for 3316. Pre: 1106 or 1204H or COMM 1016 for 3315; 3315 for 3316. (3H,3C)

3354: LITERARY AND CULTURAL CRITICISM
Introduction to the principal critical approaches used in literary analysis. Major critical schools are covered, with attention to methodology, theoretical backgrounds, and practical interpretation. Pre: 2604. (3H,3C)

3364: TOPICS IN LITERATURE BY WOMEN
This rotating topics course examines literature written by women with different national and ethnic identities and from different historical periods. Specific content varies, but the common focus is on the fundamental issues surrounding women's writing, the critical methodologies commonly employed to analyze this writing, and the historical, social, and literary contexts influencing the particular writing being studied. May be repeated once with different content. Pre: 1106 or 1204H or COMM 1016. (3H,3C)

3404 (FR 3404): FRENCH LITERATURE IN ENGLISH
Variable content course devoted to the study of major writers or periods of French literature. May be repeated with different content. May not be taken for credit toward a major or minor in French. In English. One 2000 level English literature course required. (3H,3C)

3414 (GER 3414): GERMAN LITERATURE IN ENGLISH
A variable content course devoted to the study of major German literary works in English translation. May be repeated with different content. May not be taken for credit toward a major or minor in a foreign language. No knowledge of German required. In English. One 2000 level English literature course required. (3H,3C)

3424 (RUS 3424): RUSSIAN LITERATURE IN ENGLISH
Variable-content course devoted to the study of Russian literary classics. Readings and lectures in English. Topics will range from general surveys of 19th century or 20th century Russian literature to more intensive study of the works of a single major author like Tolstoy or Dostoevsky. May be repeated with different content. No knowledge of Russian required. In English. One 2000 level English course required. (3H,3C)

3434 (SPAN 3434): HISPANIC LITERATURE IN ENGLISH
Variable content course devoted to the study of major works of Spanish and Spanish-American literature in translation. May be repeated with different content. May not be taken for credit toward a major or minor in Spanish. No knowledge of Spanish required. In English. One 2000 level English literature course required. (3H,3C)

3514: ETHNIC LITERATURE FOR CHILDREN
This course examines the historical contexts of and issues surrounding ethnic literature for children. The course considers the literature in terms of aesthetics, cultural representations, and identity. Ethnic literatures considered may include Native American, African American, Asian American, and Latino/a. The course also introduces other ethnic literary traditions, such as world folk tales, that influence or parallel American ethnic children's books. Pre: 1204H or 1106 or COMM 1016. (3H,3C)

3524: LITERATURE FOR CHILDREN
General critical and historical survey of traditional and contemporary writing for children: picture books, folk literature, modern fantasy, poetry, drama, modern fiction, historical fiction. (3H,3C)

3534: LITERATURE AND ECOLOGY

Study of the poetry, prose and dramatic literature that stresses human cooperation with nature conceived as a dynamic, interrelated series of cyclic feedback systems. Included are ways esthetic values (literary themes, form, vision, perception, language) intersect with selected ecological concepts such as biocentrism, the food chain, energy transfer, Gaia theory, and ecofeminism; selected works by contemporary ecologists and environmentalists, and a study of the origins of ecology in the Greek oikos or home. This is a writing intensive course. Pre: 1106. (3H,3C)

3544 (COMM 3544): LITERATURE AND FILM
Works of literature and the films into which they have been transformed; emphasis on differences between media. (3H,3C)

3584: THE BIBLE AS LITERATURE
This course focuses on the Bible both as a work of literature and as a major influence on the literatures of the world. Specific books of the Bible to be covered as well as literary-critical approaches will vary. Pre: 1106 or H1204 or COMM 1016. (3H,3C)

3614: SOUTHERN LITERATURE
The literature of the American South from 1840 to the present with emphasis on 20th-century fiction, drama, and poetry. Concentration on such writers as Faulkner, Capote, Chopin, Langston Hughes, O'Connor, Welty, Alice Walker, and others. Exploration of such themes as importance of land, family, community; roles of industry and agrarianism; race relations. (3H,3C)

3624: APPALACHIAN LITERATURE
Appalachian writers from the 1800s to the present, including Murfree, Wolfe, and selected contemporary authors. Course will treat artistic merit and such selected themes as the mountains, Appalachia as a frontier, ambivalence about the Civil War, religion, folk ways and traditions, coal mining, and cottage industries. (3H,3C)

3634 (AFST 3634): AFRICAN-AMERICAN LITERATURE
Afro-American writings from Phyllis Wheatley through the slave narratives of the nineteenth century to such modern figures as Wright, Hughes, Baldwin, and Morrison. Pre: 1106. (3H,3C)

3644: POSTCOLONIAL CULTURAL STUDIES
Correlates theoretical, literary, and historical materials from both "western" and "indigenous" sources in order to study at least two postcolonial settings (e.g. Indian, African, South American, Caribbean). Issues will include both contextual matters and literary problems. Pre: 1106. (3H,3C)

3654: ETHNIC AMERICAN LITERATURE
Variable content course which introduces major American ethnic literatures: African-American, Asian-American, Chicano/a, Arab-American, and Native American. Representative texts from one or two of these categories are examined within the cultural, historical, and geographical matrices within which they are written. May be repeated twice for credit if the content is different. Pre: 1106 or 1204H or COMM 1016. (3H,3C)

3684: LITERATURE AND THE LAW
This course introduces students to the representation of the law and lawyers in literature. Emphasis is placed on the cultural and historical contexts that shape our perception of the law and legal practice and on the use of facts, research, interpretation, and rhetoric in legal argument. Junior standing required. (3H,3C)

3704: CREATIVE WRITING: FICTION
This course is designed for students who want to focus in some depth on the writing of various forms of fiction as the short story and novella. Emphasis is on the writing and critiquing of original fiction in a workshop/studio environment, and the analysis of exemplary texts which serve as models. Students produce a body of original fiction in draft and revised forms. May be repeated for a maximum of 9 credit hours. Pre: 2744. (3H,3C)

3714: CREATIVE WRITING: POETRY
This course is designed for students who want to focus in some depth on the writing of poetry. Emphasis in on the writing and critiquing of original poetry in a workshop/studio environment, and the analysis of exemplary poems which serve as models. Students analyze various poetic forms and produce a revised body of original poetry. May be repeated for a maximum of 9 credit hours. Pre: 2744. (3H,3C)

3724: CREATIVE WRITING: CREATIVE NON-FICTION
This course is designed for students who want to focus in some depth on the writing of creative non-fiction in its various forms, including memoir, personal experience writing the lyrical essay, travel narratives, and nature writing. Emphasis is on the writing and critiquing of original creative non-fiction in a workshop/studio environment, and the analysis of exemplary texts which serve as models. Students produce a body of original non-fiction in draft and revised forms. May be repeated for a maximum of 9 credit hours. Pre: 2744. (3H,3C)

3744: WRITING CNTR THEORY & PRACTICE
Focus on the theory and practice of teaching writing across the disciplines in the Writing Center setting. Emphasis is on writing center theory applied to one-on-one teaching strategies and on techniques for responding appropriately to student writing. To take this course you must first have the professor's consent. (3H,3C)

3754: ADVANCED COMPOSITION
Advanced training in writing analytical and critical essays. Practice in addressing a range of audiences and in using varied styles and organizational patterns. Workshop and conference for students in arts and humanities, as well as for technical and extension students who wish to address non-specialized audiences and to practice forms outside their own fields. Junior standing required. (3H,3C)

3764: TECHNICAL WRITING
Principles and procedure of technical writing; attention to analyzing audience and purpose, organizing information, designing graphic aids, and writing such specialized forms as abstracts, instructions, and proposals. Junior standing required. (3H,3C)

3774: BUSINESS WRITING

Extensive practice in forms of persuasive and informative writing such as memos, case analyses, reports, abstracts, and letters. Designed for students in all curricula. the College of Business. Junior standing required. (3H,3C)

3804: TECHNICAL EDITING AND STYLE
Technical Editing and Style explores the art of editing from the initial writing task to the final delivery of the document. In addition to learning document management, students study and practice the roles, responsibilities, and tasks that editors perform. The course also covers the rules that govern the fundamentals of style (correctness, clarity, and propriety) and the principles needed to match the tone and formality to the aim, audience, and occasion of the work. Must have pre-requisites or the consent of the Director of Professional Writing. Pre: 3104. (3H,3C)

3814: CREATING USER DOCUMENTATION
This course prepares students to produce both print and online user documentation that enables people to accomplish a given set of tasks (e.g., user guides, online help, policy and procedure manuals, tutorials, and how-to books). Readings include rhetorical theory and discussions of professional practice. Students learn the principles of user and task analysis, information design, usability testing, and indexing. In addition, they have opportunities for hands-on experience with clients and end-users. Must have pre-requisites or the consent of the Director of Professional Writing. Pre: 3804. (3H,3C)

3824: DESIGNING DOCUMENTS FOR PRINT
This course prepares students to design and produce complex documents such as proposals, brochures, booklets, and newsletters using computer technologies. Students learn rhetorical and visual factors (e.g., legibility, readability, layout, and integration of text/images) that contribute to the effectiveness and usability of documents. In addition, students study the use of color and electronic image editing. They also master some of the technologies necessary to publish documents from their desktops. In addition to working on individual projects, students engage in collaborative exercises intended to sharpen their teamwork, editing, writing, audience- awareness, and design skills. Must have prerequisite or consent of the Director of Professional Writing. Pre: 3804. (3H,3C)

3834: INTERCULTURAL ISSUES IN PROFESSIONAL WRITING
Focuses on intercultural and international issues in the global workplace. Explores, through examination of theoretical perspectives and practical applications, ways in which notions about culture and national identity shape professional interactions. Provides a foundational understanding of the issues involved in writing and designing documents for international audiences. Pre: 3804. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

3984: SPECIAL STUDY
Variable credit course.

4024: CULTURAL STUDIES THEORY AND PRACTICE
In depth study of major theories of cultural studies with attention to their practical application in the interpretation of images, texts, artifacts, institutions, experiences, and practices. Pre-requisite: Completion of at least 60 credit hours. (3H,3C)

4044: LANGUAGE AND SOCIETY
English language variation in the United States is considered from a current sociolinguistic perspective. Social, regional, ethnic, gender, and stylistic-related language variation are covered, along with models for collecting, describing, and applying knowledge about language variation. Students are exposed to a wide range of data on language variation, with emphasis on vernacular varieties of American English. Pre: 1106 or 1204H. (3H,3C)

4054: HISTORY OF THE ENGLISH LANGUAGE
Development of English including both its internal history (sounds, vocabulary, inflections, syntax) and its external history (political, social, and intellectual forces). Indo-European origins through the present, with special emphasis on the English Language in America. (3H,3C)

4064: MODERN ENGLISH LINGUISTICS
Study of language as a rule-governed system of knowledge, with special attention to the following: transformational analysis of the structure of English sounds, words, and sentences; the history of the language, the dialects of English, and the pragmatics of communication. (3H,3C)

4074: ENGLISH SYNTAX
This course introduces the grammatical structures of the English language and the processes by which we create and comprehend English sentences. Emphasis is on recent linguistic models. Topics include morphological structure, form- and structure-class taxonomy, phrase structure, transformational and generative approaches, language variation. Alternative models will be considered. Pre: 1106. (3H,3C)

4084: TOPICS IN LINGUISTICS
An advanced course in such areas of linguistics as phonetics, phonology, morphology, syntax, language change, dialectology, etc. Emphasis will be placed on the analysis of natural language data within contemporary theoretical frameworks. Individual sections will focus upon differing areas of linguistics (to be specified in the subtitle of the course). Repeatable with different content for a maximum of nine credits. Pre: 4064 or 4074. (3H,3C)

4114: CHAUCER
This course examines the life, work, and critical reception of Geoffrey Chaucer. Junior standing required. (3H,3C)

4124: INTRODUCTION TO OLD ENGLISH
Introduction to Old English grammar and reading of Old English poetry and prose. Senior standing required. (3H,3C)

4165,4166: SHAKESPEARE
The plays of Shakespeare. 4165: Shakespeare's early career (1590-1600), including history plays from HENRY VI to HENRY V, comedies from THE COMEDY OF ERRORS to THE MERRY WIVES OF WINDSOR, and early tragedies such as ROMEO AND JULIET and JULIUS CAESAR. 4166: the later career, including "problem plays" such as MEASURE FOR MEASURE, the great tragedies (HAMLET, KING LEAR, OTHELLO,

MACBETH), and the romances such as THE TEMPEST. (3H,3C)

4214: MILTON
Milton's poetry from the early works, including COMUS, LYCIDAS, and the sonnets, to his major late works PARADISE LOST, PARADISE REGAINED, and SAMSON AGONISTES; with some attention to the important prose and to the historical context in which he wrote. (3H,3C)

4405,4406: THE ENGLISH NOVEL
4405: Development of the English novel to 1850, including such novelists as Defoe, Richardson, Fielding, Sterne, Austen, the Brontes, and Thackeray. 4406: Major novels from 1850 to World War II, including Dickens, Trollope, Eliot, Gaskell, Hardy, Woolf, Joyce, Lawrence, Huxley, and Waugh. (3H,3C)

4414: TOPICS IN SPECULATIVE FICTION
This variable content course offers an advanced exploration of deliberately anti-realistic narratives such as science fiction, utopian and dystopian fiction, and fantasy. May be taken twice with differing content. Junior standing required. (3H,3C)

4415,4416: AMERICAN NARRATIVE TO 1950
4415: The history of American narrative to 1865; 4416: The history of American narrative from 1865 to 1950; genres to be addressed may include diaries, journals, letters, autobiographies, narratives of captivity, essays, sermons, folktales, short fiction, and novels. Junior standing required. (3H,3C)

4424: DIGITAL LITERARY CULTURE
The interpretation of literary forms produced specifically for digital environments. Students will learn to analyze the design and rhetoric of hypertexts and hypermedia. Pre: 3354. (3H,3C)

4504: MODERN POETRY
British and American poetry from 1900 to World War II with emphasis on such figures as Pound, Williams, Stevens, Yeats, Sylvia Plath, Stevie Smith, and Eliot. (3H,3C)

4514: CONTEMPORARY POETRY
British and American poetry from World War II to the present, with emphasis on such figures as Bishop, Lowell, Ashbery, Heaney, and Hughes. (3H,3C)

4554: BRITISH DRAMA TO 1800
Plays from the Middle Ages through the 18th century(excluding Shakespeare). Includes works by the anonymous authors of the medieval mystery and morality plays and by such playwrights as Marlowe, Johnson, Webster, Ford, Dryden, Wycherly, and Goldsmith. (3H,3C)

4564: MODERN DRAMA
Plays by 19th and 20th century British, American, and continental dramatists, beginning with Ibsen and Shaw and culminating with Beckett and the contemporary Theatre of the Absurd. (3H,3C)

4624: STUDIES IN A BRITISH AUTHOR AFTER 1800
This course examines the life, work, and critical reception of a single major British author (or pair of closely associated authors) writing after 1800. May be taken up to 3 times with different content. Junior standing required. (3H,3C)

4634: STUDIES IN AN AMERICAN AUTHOR BEFORE 1900
This course examines the life, work, and critical reception of a single major American author (or a pair of closely associated authors) writing before 1900. May be taken up to three times with different content. Junior standing is required. (3H,3C)

4644: STUDIES IN AN AMERICAN AUTHOR AFTER 1900
This course examines the life, work, and critical reception of a single major American author (or pair of closely associated authors) writing after 1900. May be taken up to three times with different content. Junior standing is required. (3H,3C)

4664: CONTEMPORARY FICTION
Fiction since 1945 with emphasis upon the most recent two decades: the late modernist narratives of Bellow, Updike, and Percy; the new fiction of Barth, Hawkes, Barthelme; the postmodern fiction of Federman, Carter, Fowles, Katz, Sukenick. (3H,3C)

4674: STUDIES IN CONTEMPORARY CULTURE
Studies the emerging changes across arts media (including architecture, cyberculture, essay, fiction, film, painting, performance, photography, poetry, theatre, video) in relation to current cultural and social theory from a variety of disciplines (including architectural theory, art, history, literature, philosophy, psychoanalysis, and social sciences). (3H,3C)

4684: SPECIAL TOPICS IN LITERATURE
An advanced, variable-content course which explores a significant or emergent literary issue or approach, or a body of literature. May be taken twice with different content. Pre: 3204 or 3214 or 3224 or 3234 or 3244 or 3254 or 3264 or 3274. (3H,3C)

4704: ADVANCED CREATIVE WRITING: FICTION
Designed for senior English majors who have selected the Creative Writing option, this is an intensive, advanced workshop. This capstone course builds on skills students have acquired in creative writing workshops. Primary focus is on the writing and critiquing of original fiction, while paying close attention to the work of established writers who are acknowledged masters of their genres. Students hone their skills as peer reviewers and constructive critics. In the process, they produce, a portfolio of their own fiction. Co: 4734. (3H,3C)

4714: ADVANCED CREATIVE WRITING: POETRY

Designed for senior English majors who have selected the Creative Writing option, this is an intensive, advanced workshop. This capstone course builds on the skills acquired in previous creative writing workshops. Primary focus is on the writing and critiquing of original poems, while paying close attention to the work of established poets who are acknowledged masters of their genres.
Students hone their skills as peer reviewers and constructive critics. In the process, they produce a portfolio of their own poetry. Co: 4734. (3H,3C)

4724: CREATIVE WRITING: FICTION FOR YOUNG PEOPLE
This course is conducted in a workshop setting in which students compose original stories for young people. Elementary techniques of fiction are emphasized, such as plot structure, point of view, setting, characterization, and audience. Must have prerequisites or permission of the instructor. Pre: 3704. (3H,3C)

4734: SENIOR PORTFOLIO DEVELOPMENT IN CREATIVE WRITING
A course focused on the development of the senior portfolio and on making an effective and well-informed transition from undergraduate study to careers or graduate/professional school. English majors in the Creative Writing option only. Co: 4704. (1H,1C)

4774: SENIOR PORTFOLIO DEVELOPMENT IN LITERATURE, LANGUAGE, AND CULTURE
A course focused on the development of the senior portfolio and on making an effective and well-informed transition from undergraduate study to careers or graduate/professional school. English majors in the Literature, Language, and Culture option only. Co: 4784. (1H,1C)

4784: SENIOR SEMINAR
Designed for senior English majors, this is a variable topics, in-depth study of a particular issue or theme in language or literature. This capstone course aims to integrate and synthesize previous work in the discipline, focusing especially on close reading, research, and writing skills. Pre: 1106. Co: 4774. (3H,3C)

4804: GRANT PROPOSALS AND REPORTS
This course prepares students to write effective proposals, reports, and informational articles. Students learn to define and write problem statements, program objectives, plans of action, evaluation plans, budget presentations, and summaries. In addition, they sharpen their teamwork, editing, writing, audience awareness, and design skills as they engage in collaborative projects with campus and/or non-profit organizations in the community. Prerequisite or consent of the instructor is required. Pre: 3804. (3H,3C)

4814: WRITING FOR THE WEB
This course prepares students to write and design complex documents for the World Wide Web, with a particular emphasis on communicating complex, technical,
and scientific information. Students learn rhetorical principles, writing strategies, visual design factors, and technologies needed to create effective, usable web sites. They will develop sites in both individual and team settings, apply the principles of usability testing, and locate and use resources to help them keep pace with this rapidly changing field. Pre: 3804. (3H,3C)

4824: SCIENCE WRITING
Writing in and about the natural and social sciences. Students will write documents such as abstracts, research proposals, and ethnographies, analyze the development of disciplinary writing practices, and study non-fiction science writing for general audiences. Senior standing or instructor approval required. Pre: 1106 or 1204H or COMM 1016. (3H,3C)

4864: SENIOR PORTFOLIO DEVELOPMENT IN PROFESSIONAL WRITING
A course focused on the development of the senior portfolio and on making an effective and well-informed transition from undergraduate study to careers or graduate/professional school. English majors in the Professional Writing option only. Co: 4874. (1H,1C)

4874: ISSUES IN PROFESSIONAL AND PUBLIC DISCOURSE
In this course designed for English majors in the Professional Writing Option, students will focus on the ways in which scientific, technical, and professional communication influence, and are influenced by, public discourse. Drawing on strategies of rhetorical criticism, students will gain an understanding of the persuasive value of style, arrangement, and delivery by investigating their professional roles in helping to structure public debate. Pre: 3804. Co: 4864. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences

Foreign Languages and Literatures

http://www.fll.vt.edu/

Richard Shryock, Chair
Alumni Distinguished Professor: Jacqueline E. Bixler
Professors: P.A. Mellen (Emeritus); T.L. Papillon; J.L. Shrum; D. Stoudt; J.C. Ulloa
Associate Professors: A.S. Becker (Associate Chair); S.W. Farquhar (Emeritus); A.A. Fernández-Vasquez; J.A. Folkart; M. Guèye; S.P. Johnson; N. Milman-Miller; M. Panford (Associate Chair); R.L. Shryock; F.G. Teulon; R.J. Watson
Assistant Professors: A. Abiragi; L. Allingham; E. Austin; R. Efird; A. Gudmestad; S. Hofer; C. Noirot; S. Sierra
Visiting Assistant Professors: K. Jensen; R. Joseph; R.L. Phillips
Instructors: W. Bryce; E.C. Calvera; A. Dalton; O. Guo; M. Hatzios; J. Lynn; N. Lopez; Y., T. McKagen; Minkova; O. Monem; F. Rousseau-Mizutani; E. Shooltz; S. Slawny-Levitan; J. Stubbs; G. Vargas

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Overview

The study of foreign languages and literatures opens doors to international understanding and the appreciation of ancient and contemporary foreign civilizations. The department gives interested students of the university an opportunity to enroll in its courses:

- To major or minor in a language;
- To become a more aware and informed citizen of the world;
- To prepare for careers in international organizations, the Foreign Service, government, business or industry, teaching;
- To prepare for a study abroad program;
- To obtain humanities credits on an elective basis;
- To fulfill undergraduate language requirements;
- To satisfy graduate reading requirements;
- Just out of interest.

Majors and Minors are offered in French, German, Spanish, and Classical Studies, and a Russian Area Studies major is available, under the Interdisciplinary Studies Program. Minors are also given in Classical Languages, French for Business, Latin, and Russian. The department also offers instruction in Chinese, modern Greek, Hebrew, Italian, and Japanese. In addition to fulfilling the requirements of the core curriculum of the College of Liberal Arts and Human Sciences, the foreign language major must complete 30 hours at the 3000-level and above in a single foreign language (with the exception of Classical Studies), according to the following requirements in the individual languages.

A minimum grade of C (2.0) must be earned by foreign language majors and minors in all courses required for the major or minor.

Classical Studies Major

To complete the interdisciplinary major in Classical Studies a student must complete 36 hours: 18 in Classical Studies (Humanities, History, Art & Art History, Mythology, Literature, Culture, Religion, etc.) and 18 hours in Classical Languages (Ancient Greek and/or Latin). For

information on required courses and for a checksheet, see the Classical Studies website (http://www.fll.vt.edu/Classics/ClassicsHome.html) or the Department of Foreign Languages and Literatures (331 Major Williams Hall, 231-5361).

Classical Studies Minor

To obtain an interdisciplinary minor in Classical Studies a student must complete 18 hours in Classical Studies. For information on required courses and for a checksheet, see the Classical Studies website (http://www.fll.vt.edu/Classics/ClassicsHome.html) or the Department of Foreign Languages and Literatures (331 Major Williams Hall, 231-5361).

Classical Languages Minor

To obtain a minor in Classical Languages a student must complete 18 hours in Classical Languages (Ancient Greek and/or Latin). For information on required courses and for a checksheet, see the Classical Studies website (http://www.fll.vt.edu/Classics/ClassicsHome.html) or the Department of Foreign Languages and Literatures (331 Major Williams Hall, 231-5361).

Latin American Studies Concentration (LAAS)

The LAAS concentration constitutes an 18-hour minor within the existing IDST program. The LAAS concentration is interdisciplinary, offering courses in history, civilization, culture and literature, economics, political science, urban affairs and planning, geography, and international studies. A combination of six courses from the areas of history, culture, and development form the concentration. The LAAS concentration may be combined with a minor in Spanish and another approved 18-hour concentration to form a major in IDST. Students pursuing this degree will be enrolled as majors in the IDST program. Requirements for the concentration can be obtained from the offices of the Center for Interdisciplinary Studies or the Department of Foreign Languages and Literatures.

Concentration Coordinator: A. A. Fernández-Vázquez, Language Majors

TOP

Language Majors/Minors

French Major

To complete a major in French, a student must complete 30 hours at the 3000-level and above, including the following required courses: 3105, 3106, *3126, **3304, four of the following five courses 3205, 3206, 3305, 3306, 3314, six hours of ***4314 and 4154.

*Students may be exempted from French 3126 through demonstrating satisfactory oral proficiency by examination, in which case no credit is granted and three additional hours of advanced elective course work in French may be necessary to complete the required 30 hours. Students not placing into or out of 3126 are strongly advised to take 3125, which is designed to enable students to achieve the level of oral proficiency required for entry into 3126. For most students the hours represented by 3125 will be in addition to the minimum of 30 required for the major.

** Although 3304 is a prerequisite for 3305, 3306 and 3314, it may be waived in some instances. Contact section coordinator for details.

***French 4314 is a variable content three-credit course which may be repeated for credit. When appropriate, depending on the topic, students may petition the department for consent to use French 4324 to satisfy three hours of the six hour 4000-level French literature requirement.

Except with consent in special cases, the 30 hours must be in French courses exclusive of 2964: Field Study; 2984: Special Study; 4964: Field Study; 4974: Independent Study; 4984: Special Study; 4994: Undergraduate Research.

French Minor

To obtain a minor in French, a student must complete 18 hours in French at the 2000-level and above, 12 of which must be taken at the advanced level, including 3105, 3106. Student must take at least one 3000-level French culture and civilization course and one 3000-level French literature course. French 3314 can count either as a culture and civilization course or as a literature course. In some instances, French 3164 may count toward the minor. See French section coordinator.

French for Business Minor

The French for Business minor requires 18 hours in French at the 2000-level and above. The minor must include the following courses: 2164, 3105, 3106, 3164 and one of the following: 2714, 3205 or 3206.

Advanced French for Business Minor

The Advanced French for Business minor requires 18 hours at the 3-4000 level. It must include the following courses: 3105, 3105, 3164, 3304, 4164 and either 3205 or 3206.

French for Business Concentration

To obtain the French for Business concentration, a student must complete 18 hours on the 1-2000 level in French including the following courses: 2164 and 2714.

German Major

To complete a major in German, a student must complete 30 hours at the 3000-level and above, including the following required courses: 3105, 3106, *3126, 3204, 3305, 3306, 4154, and six hours of **4000-level literature.

* Students may be exempted from German 3126 through demonstrating satisfactory oral proficiency by examination, in which case **no credit is granted** and three additional hours of advanced elective course work in German will be necessary to complete the required 30 hours. Students not placing into or out of 3126 are strongly advised to take 3125, which is designed to enable students to achieve A8e level of oral proficiency required for entry into 3126. For most students the hours represented by 3125 will be in addition to the minimum of 30 required for the major.
** GER 4xxx includes 4304 and any of the variable-content 4000-level German literature courses which may be repeated for credit. When appropriate, depending on the topic, students may petition the department for consent to use German 4334 to satisfy three hours of the six hour 4000-level German literature requirement.
Except with consent in special cases, the 30 hours must be in German courses exclusive of 2724: Introduction to German Culture and Civilization; 2964: Field Study; 2984: Special Study; 4964: Field Study; 4974: Independent Study; 4984: Special Study; and 4994: Undergraduate Research.

TOP

German Minor

To obtain a minor in German, a student must complete 18 hours in German at the 2000-level and above, 12 of which must be taken at the advanced level, including 3105, 3106, 3204, and 3305 or 3306, exclusive of 2724.

Latin Minor

To obtain a minor in Latin, a student must complete 18 hours of course work in Latin, including 6 hours at the 3000 level or above.

Russian Area Studies Degree Option

Although the department does not offer a Russian major, students can utilize the existing resources of the university to pursue an interdisciplinary IDST (B.A.) degree program in Russian Area Studies. The program provides interested students with sufficient background in Russian language, culture, and area studies to pursue careers in diplomacy, international business, journalism, government service or to continue their Russian studies in graduate school. The program aims at developing competence in a single discipline and in the Russian language while providing a broad background in Russian area studies. The program complements but does not duplicate the existing major in International Studies.

An 18-hour minor in Russian Studies is offered as part of the IDST Program. This concentration includes courses drawn from Humanities, Foreign Languages, English, Political Science, and History. Requirements for the concentration can be obtained from the CIS or Foreign Languages and Literatures office.

Concentration Coordinator: Amy Nelson (History).

Russian Minor

To obtain a minor in Russian, a student must complete 18 hours in Russian at the 2000-level and above, 12 of which must be taken at the advanced level, including 3105, 3106, and any additional 6 hours of Russian **language** courses at the 3000-level or above.

Spanish Major

To complete a major in Spanish, a student must complete 30 hours at the 3000-level and above, including the following required courses:

3105, 3106, *3126, 3414 (prior 3204), 3444 (prior 3214), 3304, 3404 (prior 3314), 3454 (prior 3324), and six hours of **4000-level literature.

* Students may be exempted from Spanish 3126 through demonstrating satisfactory oral proficiency by examination, in which case **no credit is granted** and three additional hours of advanced elective course work in Spanish will be necessary to complete the required 30 hours. Students not placing into or out of 3126 are strongly advised to take 3125, which is designed to enable students to achieve the level of oral proficiency required for entry into 3126. For most students the hours represented by 3125 will be in addition to the minimum of 30 required for the major.

** At the 4000 level, students are required to do a minimum of three hours of Spanish literature course work.

Except with consent in special cases, the 30 hours must be in Spanish courses exclusive of 2964: Field Study; 2984: Special Study; 4964: Field Study; 4974: Independent Study; 4984: Special Study; 4994: Undergraduate Research.

Spanish Minor

To obtain a minor in Spanish, a student must complete 18 hours at the 2000-level and above, 12 of which must be taken at the advanced level, including 3105, 3106, 3304, and one of the following: 3404, 3414, 3444, 3454 .

Concentrations

Latin American Studies Concentration (LAAS)
The LAAS concentration constitutes an 18-hour concentration within the existing IDST program. The LAAS concentration is interdisciplinary, offering courses in history, civilization, culture and literature, economics, political science, urban affairs and planning, geography, and international studies. A combination of six courses from the areas of history, culture, and development form the concentration. The LAAS concentration may be combined with a minor in Spanish and another approved 18-hour concentration to form a major in IDST. Students pursuing this degree will be enrolled as majors in the IDST program. Requirements for the concentration can be obtained from the offices of the Center for Interdisciplinary Studies or the Department of Foreign Languages and Literatures.
Concentration Coordinator: A. A. Fernández-Vázquez

Restrictions

1000 level courses do not count for Majors or Minors in French, German, Russian, or Spanish.

1000 level courses do count toward Majors and Minors in Classical Studies, Latin, and Classical Languages.

Other courses that do not count toward the major or minor: Classics 2444, Classics 2454, French 2714, French 2964, French 2984, French 3195-3196, French 3404, French 4964, French 4974, French 4984, French 4994, German 2724, German 2964, German 2984, German 3195-3196, German 3414, German 4964, German 4974, German 4984, German 4994, Latin 2964, Latin 4964, Latin 4974, Latin 4994, Russian 2734, Russian 2964, Russian 2984, Russian 3424, Russian 4964, Russian 4974, Russian 4984, Russian 4994, Spanish 2744, Spanish 2754, Spanish 2964, Spanish 2984, Spanish 3434, Spanish 4964, Spanish 4974, Spanish 4984, Spanish 4994.

Questions about courses numbered 4964, 4974, 4984, and 4994 should be addressed to the Coordinator of the specific language section or the department chair No more than six hours of 4964 (Field Study) may be taken.

Courses designated 3195-3196 do not satisfy the foreign language requirement for the university or the College of Liberal Arts and Human Sciences.

Courses designated Fr. 3954, Ger. 3954, and Span 3954 (Study Abroad) may carry major credit only if the student is eligible to pursue courses above the second-year level; otherwise credits will be assigned at the first and second-year level as appropriate in each individual case.

In addition to its formal courses, the department offers informal extracurricular activities, such as conversation groups, language tables, and language clubs, all of which are open to the university community.

TOP

Independent Study

The minimum grade point averages required for independent study in the Department of Foreign Languages are 3.3 in 3000- and 4000-level courses in the language of the independent study; and at least 2.5 overall and no lower than 3.0 in all course work done after the freshman year. Students wishing to enroll in courses designated 4974 (Independent Study) must receive permission from the instructor and the department chair in the term prior to enrollment. No more than eight hours of independent study and/or undergraduate research combined may be counted toward a degree.

Teaching Certification

Those majors who are preparing to teach a foreign language in the public schools should consult the College of Liberal Arts and Human Sciences and plan a course of study leading to the Collegiate Professional Certificate upon graduation.

Study Abroad

The department encourages students to work and/or study abroad. Information relating to work and/or study abroad programs is available from the department office (331 Major Williams) and from the Study Abroad Office.

The department offers programs of study in the summer in Paris; Madrid; Moscow; Greece; Switzerland and semester- or year-long exchange programs in Caen (France), Quito (Ecuador), and Xalapa (Mexico).

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics" in this catalog), toward the College of Liberal Arts and Human Sciences core (see first part of this chapter), and toward the degrees in French, German, and Spanish.

Repeating Work Completed

Students who have studied a foreign language may not repeat work completed at another institution without advance permission of the instructor. For example, those who have studied four years of a language in high school cannot normally study that language at the elementary level for credit. In addition, native speakers may not take language courses in their native language for credit.

B.A. in French

Satisfactory progress toward the B.A. in French requires that for continued enrollment in the major,

1. **Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal), students must have completed:**

FR 3105: Grammar, Comp., and Conversation	3
FR 3304: Introduction to French Literature	3
Credits	**(6)**

1. **By the end of the junior year, students must have an in-major grade point average of 2.0 or above and have completed:**

FR 3105, 3106: Grammar, Comp., and Conversation	6
FR 3205: French Culture and Civilization ***or*** Fr 3206: French Culture and Civilization	3
FR 3304: Introduction to French Literature	3
FR 3305, 3306: Survey of French Literature	6
Credits	**(18)**

B.A. in German

Satisfactory progress toward the B.A. in German requires that for continued enrollment in the major,

1. **Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal), students must have completed:**

GER 3105: Grammar, Comp., and Conversation	3
GER 3204: Culture of German-Speaking Countries (If not offered in senior year)	3
GER 4154: Advanced Composition and Stylistics (If not offered in senior year)	3
Total Credits	**(9)**

2. **By the end of the junior year, students must have an in-major grade point average of 2.0 or above and must have completed:**

GER 3105, 3106: Grammar, Comp., and Conversation	6

GER 3204: Culture of German-Speaking Countries (If not offered in senior year)	3
GER 3305, 3306: Survey of German Literature	6
GER 4154: Advanced Composition and Stylistics (If not offered in senior year)	3
Credits	**(18)**

B.A. in Spanish

Satisfactory progress toward the B.A. in Spanish requires that for continued enrollment in the major,

1. **Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal), students must have completed:**

SPAN 3105, 3106: Grammar, Comp., and Conversation	6
One of the following: SPAN 3404, 3414, 3444, 3454	3
SPAN 3304: Introduction to Hispanic Literature	3
Credits	**(12)**

2. **By the end of the junior year, students must have an in-major grade point average of 2.0 or above and must have completed:**

SPAN 3105, 3106: Grammar, Comp., and Conversation	6
One of the following: SPAN 3404, 3414, 3444, 3454	3
SPAN 3304: Introduction to Hispanic Literature	3
SPAN 3314: Survey of Peninsular Literature	3
Credits	**(15)**

TOP

Undergraduate Courses (FL)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4104 (MGT 4104): GLOBAL CULTURE
This course will examine problems of cultural differences using an interdisciplinary approach combining Business Studies with Cultural Studies in the humanities and social sciences. It will address issues related to living and working with people from other countries or cultures, whether domestically or abroad. It will also explore the impact of globalization on various aspects of culture. Junior standing required. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Chinese Undergraduate Courses (CHN)

1105-1106: ELEMENTARY CHINESE
Fundamentals of the Chinese language with emphasis on developing proficiency in practical language use and cultural competency. 1105

is for students with no prior knowledge of the language; 1106 is for students who have completed 1105, or more than one year, but less than three years of high school Chinese. (3H,3C)

2105-2106: INTERMEDIATE CHINESE
Emphasizes comprehension of written and spoken Mandarin Chinese, communication in Chinese; study of some literature and culture of the Chinese people. 2105 is for students who have completed 1105 and 1106 or equivalent. 2106 is for students who have completed 2105 or equivalent. X-grade allowed. Pre: 1106. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Classics Undergraduate Courses (CLA)

2444 (ENGL 2444) (HUM 2444): ANCIENT GREEK AND ROMAN MYTHOLOGY
Survey of Ancient Greek and Roman mythology and modern interpretations. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (3H,3C)

2454 (ENGL 2454) (HUM 2454): ANCIENT GREEK AND LATIN LITERATURE IN ENGLISH TRANSLATION
A variable content course devoted to the study of major works of Ancient Greek and Latin literature in English translation. May be repeated for credit with different content. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (3H,3C)

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3954: STUDY ABROAD
Variable credit course.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

French Undergraduate Courses (FR)

1105-1106: ELEMENTARY FRENCH
Fundamentals of the French language with emphasis on grammar, reading, composition, and conversation. 1105 for students with no prior knowledge of the language; 1106 for students who have completed 1105 or less than three years in high school. X-grade allowed. (3H,3C) I,II,III,IV.

2105-2106: INTERMEDIATE FRENCH
Emphasizes comprehension of written and spoken French, communication in French, literature, and culture of French-speaking world. X-grade allowed. Pre: 1106 for 2105; 2105 for 2106. (3H,3C) I,II.

2164: INTERMEDIATE BUSINESS FRENCH
This course emphasizes all four language skills (reading, writing, speaking, and listening) by focusing on various facets of the world of business and technology. It also develops students' understanding of French institutions and business practices. Pre: 2105. (3H,3C) II.

2714 (HUM 2714): INTRODUCTION TO FRENCH CULTURE AND CIVILIZATION
French culture and civilization from the Middle Ages to the present. Interdisciplinary approach to literature, film, art, architecture, and theatre in the context of French cultural history. In English. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3105,3106: GRAMMAR, COMPOSITION AND CONVERSATION
Progressive and comprehensive review of French syntax and morphology. Practice in written and oral expression in French on a variety of topics in French culture. Conducted in French. May be taken out of sequence. X-grade allowed. Pre: 2106. (3H,3C) I,II.

3125-3126: FRENCH FOR ORAL PROFICIENCY
For acquisition of measured levels of proficiency in speaking and understanding spoken French. Content-based instruction in small groups. 3125: to achieve an oral proficiency rating comparable to "Intermediate-high" on the American Council on the Teaching of Foreign Languages Oral Proficiency Interview (ACTFL-OPI) or "S -1+" on the Foreign Service Institute (FSI) scale. 3126: to achieve an oral proficiency rating comparable to "Advanced" on the ACTFL-OPI or a "2" on the FSI scale. Admission by oral exam. Pass/Fail only. X-grade allowed. Pre: 3105, 3106. (3H,3C) I,II.

3164: ADVANCED BUSINESS FRENCH
In this skills-based course, students learn to use appropriate French technical vocabulary for different business contexts, do translation, write professional correspondence, and read articles related to the worlds of business, economics, and finance. Cross-cultural differences regarding the work place are also a focus of the course. I Pre: 3105, 3106. (3H,3C)

3195-3196: FRENCH FOR READING KNOWLEDGE
3195: Fundamentals of grammar with emphasis on idiomatic patterns and translation technique; 3196: Continues presentation of grammar with increasing emphasis on directed translation of material chosen from the student's major field of interest. Primarily for graduate students. Partially duplicates 1105-1106. Does not satisfy the Arts and Sciences core curriculum foreign language requirement. (2H,2C) I,II,III,IV.

3205,3206: FRENCH CULTURE AND CIVILIZATION
3205: Patterns of French life and culture in the context of social, intellectual, and institutional changes from the Middle Ages to the French Revolution. 3206: From the French Revolution to the present with an introduction to other francophone parts of the world. Pre: (3105, 3106). (3H,3C) 3205: I,II; 3206:

3304: INTRODUCTION TO FRENCH LITERATURE
Introduction to French literature through analysis and discussion of selected texts from different periods and genres. Methods, terminology, and practice of literary analysis. Intensive writing component. X-grade allowed. Pre: 2106. (3H,3C) II.

3305,3306: SURVEY OF FRENCH LITERATURE
Readings in French literature from the Middle Ages to the present to acquaint students with literary techniques and contexts. Pre: 3304, 3105, 3106. (3H,3C)

3314: INTRODUCTION TO FRANCOPHONE STUDIES
Introduction to the literatures and cultures of French- speaking countries outside of France including North Africa, the Caribbean, Sub-Saharan Africa, and Quebec. Examination of thematic and cultural aspects of literatures of these regions within their socio-historical contexts; explorations of such notions as postcolonialism, identity, race, and nation as they relate to the legacy of colonial France. Pre: 3105, 3106, 3304. (3H,3C)

3404 (ENGL 3404): FRENCH LITERATURE IN ENGLISH
Variable content course devoted to the study of major writers or periods of French literature. May be repeated with different content. May not be taken for credit toward One 2000 level English literature course required. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4154: ADVANCED COMPOSITION AND STYLISTICS
Intensive work in written French. Development of the student's ability to write clear, correct, and articulate French in a variety of modes (e. g., epistolary style, the formal and informal essay). Writing intensive. Pre: 3106. (3H,3C)

4164: SPECIAL TOPICS IN BUSINESS FRENCH
A variable content course devoted to developing and perfecting highly advanced language skills through the study of special topics in the French and francophone business worlds. Emphasis on a mastery of specialized French for professional settings. May be repeated for credit with different content. Taught even years. Pre: 3106, 3164. (3H,3C) II.

4314: STUDIES IN FRENCH LITERATURE
In-depth study of a selected topic in French literature, such as an author, a group of authors, a literary movement or genre during a specific period of French literary history (i.e., Voltaire, the Pleiade, Romanticism, the nouveau roman). May be repeated for credit with different content. Pre: 3105, 3106, (3305 or 3306 or 3314). (3H,3C) I,II.

4324: SPECIAL TOPICS IN FRENCH LIFE, LITERATURE AND LANGUAGE
In-depth study of a selected topic in French culture or language as manifested in creative and historical literature, music, art, film, etc., such as phonetics, translation techniques, or the staging of dramatic works in French. May be repeated for credit with different content. Pre: (3105, 3106) or (3205, 3206). (3H,3C) I,II.

4794: SENIOR TUTORIAL IN FRENCH STUDIES
Individual or small group sessions which give the student the opportunity to hone special language skills, with a focus on post-graduation application of these skills. May concentrate on areas such as technical or business language, linguistics, translation, interpreting, creative writing, specialized literary, or cultural studies. May be taken twice for credit with different content. Must be pre-arranged three weeks before end of previous semester. One 4000 level French course, senior standing, French major, and consent of French Section required. (1H,1C) I, II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

German Undergraduate Courses (GER)

1105-1106: ELEMENTARY GERMAN
Fundamentals of the German language with emphasis on grammar, reading, composition, and conversation. 1105: for students with no prior knowledge of the language; 1106: for students who have completed 1105 or less than three years in high school. (3H,3C) I,II.

1114: ACCELERATED ELEMENTARY GERMAN
Proficiency-oriented approach to elementary German, designed for learners who wish to progress rapidly through the beginning stages of language learning. It develops the four language skills (speaking, listening, reading, writing) in a cultural context. Partially duplicates GER 1105 and 1106. (6H,6C)

2105-2106: INTERMEDIATE GERMAN
Review of grammar with increasing emphasis on reading, writing, and oral communication. Pre: 1106. (3H,3C) I,II.

2114: ACCELERATED INTERMEDIATE GERMAN
Proficiency-oriented approach to intermediate German, designed for learners who wish to progress rapidly through the intermediate stages of language learning. The course strengthens the four language skills (speaking, listening, reading and writing) in a cultural context. Accelerated version of GER 2105-2106. Pre: 1106. (6H,6C)

2724 (HUM 2724): INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION
German culture and civilization from the earliest period to the present. Interdisciplinary approach to literature, film, art, architecture, music, and theatre in the context of German cultural history. In English. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY

Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: COMMERCIAL GERMAN
Development and application of written and oral German needed for commercial transactions: reading of business letters and journals; composition of business correspondence; participation in business meetings; business etiquette in German-speaking countries. Pre: 2106. (3H,3C)

3105,3106: GRAMMAR, COMPOSITION AND CONVERSATION
Progressive and comprehensive review of German syntax and morphology. Practice in written and oral expression in German on a variety of topics in German culture. 3106 Writing intensive. Pre: 2106. (3H,3C) I,II.

3125-3126: GERMAN ORAL PROFICIENCY
For acquisition of measured levels of proficiency in speaking and understanding spoken German. Content-based instruction in small groups. 3125: to achieve an oral proficiency rating comparable to "Intermediate-high" on the American Council on the Teaching of Foreign Languages Oral Proficiency Interview (ACTFL-OPI) or "S-1+" on the Foreign Service Institute (FSI) scale. 3126: to achieve an oral proficiency rating comparable to "Advanced" on the (ACTFL-OPI) or a "2" on the FSI scale. Admission by oral exam. Taught alternate years. Pass/Fail only. (3H,3C) I,II.

3195-3196: GERMAN FOR READING KNOWLEDGE
3195: Fundamentals of grammar with emphasis on idiomatic patterns and translation technique; 3196: Continues presentation of grammar with increasing emphasis on directed translation of material chosen from the student's major field of interest. Primarily for graduate students. Partially duplicates 1105-1106. Does not satisfy the Arts and Sciences core curriculum foreign language requirement. (2H,2C) I,II,III,IV.

3204: CULTURE OF THE GERMAN-SPEAKING COUNTRIES
Study of German, Austrian, and Swiss culture and civilization from the Middle Ages to the present, including literature, art, architecture, film, and music. Pre: 3104 or 3105 or 3106. (3H,3C)

3305,3306: SURVEY OF GERMAN LITERATURE
3305: Readings in major works of German literature from the late Middle Ages to the end of Classicism. 3306: Readings in major works of German literature from Romanticism to the end of World War II. Pre: 3105 or 3106. (3H,3C) I,II.

3414 (ENGL 3414): GERMAN LITERATURE IN ENGLISH
A variable content course devoted to the study of major German literary works in English translation. May be repeated with different content. May not be taken for credit toward a major or minor in a foreign language. No knowledge of German required. In English. One 2000- level English literature course required. (3H,3C)

3474: TOPICS IN GERMAN CINEMA
This course introduces students to critical issues in the history of German Cinema. It examines the aesthetic characteristics of each major period, with an emphasis on cinematic trends and the way in which film reflects cultural developments in German-speaking countries. The specific thematic content is variable. The course is taught in English. It may be taken twice for credit with different content. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4154: ADVANCED COMPOSITION AND STYLISTICS
Intensive advanced work in written German. Development of the student's ability to write clear, correct, and articulate German in a variety of modes. Style analysis. Writing intensive. Pre: 3106. (3H,3C)

4304: AGE OF GOETHE
Major writers of the age of Goethe: Goethe, Schiller, and Holderlin; the development of German Classicism. Pre: 3106, 3306. (3H,3C)

4314: STUDIES IN 19TH-CENTURY LITERATURE
Variable content course devoted to the study of 19th century drama, lyric, and prose. May be repeated for credit with different content. Pre: 3106, 3306. (3H,3C)

4324: STUDIES IN 20TH-CENTURY LITERATURE
A variable content course devoted to the study of major literary works of the 20th century. May be repeated for credit with different content. Pre: 3106, 3306. (3H,3C)

4334: SPECIAL TOPICS IN GERMAN LIFE, LITERATURE, AND LANGUAGE
Variable content course devoted to the study of various aspects of German culture, literature, and language. May be repeated for credit with different content. Pre: (3106 or 3105), (3306 or 3305). (3H,3C)

4794: SENIOR TUTORIAL IN GERMAN STUDIES
Individual or small group sessions which give the student the opportunity to hone special language skills, with a focus on post-graduation application of these skills. May concentrate on areas such as technical or business language, linguistics, translation, interpreting, creative writing, specialized literary, or cultural studies. Must be pre-arranged three weeks before end of previous semester.

May be taken twice for credit with different content. PRE: one 4000-level German course, major with senior standing, and consent required. (1H,1C) I,II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Greek Undergraduate Courses (GR)

1105-1106: CLASSICAL AND NEW TESTAMENT GREEK
Introduction to classical/New Testament Greek, for development of reading ability. 1105: Accidence, syntax, and vocabulary, with translation of short readings of graded difficulty. 1106: Accidence, syntax, and vocabulary continued, with the introduction of selected longer passages from ancient Greek authors. (3H,3C) I,II.

2104 (REL 2104): GREEK NEW TESTAMENT
Readings from the New Testament in Greek, with attention to grammatical analysis, historical background and other clues to interpretation. May be repeated with different content for a maximum of 9 credits. Pre: 1106. (3H,3C)

2114: READINGS IN CLASSICAL GREEK LITERATURE
Study of several major writers of ancient Greek literature in the original. Selections from epic poetry, tragedies, philosophical dialogues, history and oratory. Taught alternate years. May be repeated with different content for a maximum of 9 credits. Pre: 1106. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Hebrew Undergraduate Courses (HEB)

1104 (JUD 1104): INTRODUCTION TO HEBREW LANGUAGE, CIVILIZATION AND CULTURE
Fundamentals of Modern Hebrew language with emphasis on grammar, reading, composition, and conversation. For students with no prior knowledge of the language. (3H,3C)

1114 (JUD 1114): ACCELERATED ELEMENTARY HEBREW LANGUAGE
Complementary introduction to the fundamentals of Modern Hebrew language with continued emphasis on grammar, reading, composition, and conversation. This course is for students who have completed 1104 or with permission of the instructor. 1114 is a four-credit course with a self-instruction component that demands student time outside of the class. (3H,2L,4C)

TOP

Italian Undergraduate Courses (ITAL)

1105-1106: ELEMENTARY ITALIAN
Fundamentals of the Italian language with emphasis on grammar, reading, composition, and conversation. 1105: for students with no prior knowledge of the language; 1106: for students who have completed 1105 or less than three years in high school. (3H,3C) I,II.

2105-2106: INTERMEDIATE ITALIAN
Emphasizes comprehension of written and spoken Italian, communication in Italian, literature, and culture of Italy. Pre: 1106. (3H,3C) I,II.

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Japanese Undergraduate Courses (JPN)

1105-1106: ELEMENTARY JAPANESE
Fundamentals of the Japanese language with emphasis on developing proficiency in practical language use and cultural competency. 1105 is for students with no prior knowledge of the language; 1106 is for students who have completed 1105, or more than one year, but less than three years of high school Japanese. (3H,3C)

2105-2106: INTERMEDIATE JAPANESE
Emphasizes comprehension of written and spoken Japanese, communication in Japanese; study of some literature and culture of the Japanese people. 2105 is for students who have completed 1105 and 1106 or equivalent. 2106 is for students who have completed 2105 or equivalent. X-grade allowed. Pre: 1106. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.
I,II,III,IV,V.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Latin Undergraduate Courses (LAT)

1105-1106: ELEMENTARY LATIN
Introduction to Latin, for development of reading ability. 1105: Accidence, syntax, and vocabulary, with translation of discrete sentences and short readings of graded difficulty. 1106: Accidence, syntax, and vocabulary continued, with the introduction of selected passages

from ancient Roman authors for reading, comprehension, and translation. (3H,3C) I,II.

2104: CICERO AND LIVY
A course in two major Latin prose authors. Review and refinement of grammar is combined with an increasing attention to historical, cultural, linguistic, and literary questions. May be repeated with different content for a maximum of 9 credits. Pre: 1106. (3H,3C)

2114: LATIN EPIC: VERGIL AND OVID
A course in two important Latin poets of the Age of Augustus with a view to increasing the students ability to understand and read Latin. Review and refinement of grammar is combined with an increasing attention to historical, linguistic, cultural, and literary questions. May be repeated with different content for a maximum of 9 credits. Pre: 1106. (3H,3C)

2124: LATIN LYRIC: CATULLUS AND HORACE
Two important Latin poets of the Late Republic. Review and refinement of grammar is combined with an increasing attention to historical, linguistic, cultural, and literary questions. May be repeated with different content for a maximum of 9 credits. Pre: 1105, 1106. (3H,3C)

2134: LATE MEDIEVAL LATIN
Post-classical Latin, from Augustine and Boethius through the Middle Ages. Review and refinement of grammar is combined with an increasing attention to historical, cultural, linguistic, and literary questions. May be repeated with different content for a maximum of 9 credits. Pre: 1105, 1106. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: READINGS IN LATIN LITERATURE
A variable content course devoted to the study of major Latin texts not offered in the 2000-level courses. Emphasis is on content, style, and context. May be repeated for credit with different content. Two 2000-level courses in Latin or equivalent proficiency required. Writing Intensive. (3H,3C)

4004: DIRECTED STUDIES IN LATIN PROSE COMPOSITION
Application of Latin grammar structure to the translation of English into Latin. Original compositions are written in Latin. (Will be offered during the academic year whenever there is sufficient enrollment and available staffing). One 3000-level course in Latin required. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Portuguese Undergraduate Course (PORT)

1105-1106: BEGINNING CONVERSATIONAL PORTUGUESE
Essential vocabulary and structures of the Portuguese language as spoken in Brazil; emphasis on active spoken and written use of the language for practical daily purposes. (3H,3C) I,II.

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Russian Undergraduate Courses (RUS)

1105-1106: ELEMENTARY RUSSIAN
Fundamentals of grammar, pronunciation, conversation. 1105: Grammar and conversation; 1106: Grammar, conversation, and several selected readings from Russian literature. (4H,4C) I,II.

2105-2106: INTERMEDIATE RUSSIAN
Grammar, reading, conversation, and composition. Emphasizes comprehension of written and spoken Russian. Pre: 1106. (3H,3C) I,II.

2734 (HUM 2734): INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
Russian culture and civilization from the Middle Ages to the present. Interdisciplinary approach to Russian literature, art, architecture, music, film, and theatre in the context of Russian cultural history. In English. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3105,3106: GRAMMAR, COMPOSITION AND CONVERSATION
Detailed study of grammar. Practice in written and oral expression in Russian on a variety of topics. Supplementary readings to emphasize application of grammatical principles. 3105 includes a rapid grammatical review. Pre: 2106. (3H,3C) I,II.

3124: RUSSIAN FOR ORAL PROFICIENCY
Devoted to the acquisition of measured levels of proficiency in speaking and understanding spoken Russian. Content-based instruction in small groups. For students who would like to achieve an oral proficiency rating comparable to "Intermediate-high" on the American Council on the Teaching of Foreign Languages Oral Proficiency Interview (ACTFL-OPI) or "S-1+" on the Foreign Service Institute (FSI) scale. Admission by oral exam required. Taught alternate years.Pass/Fail only. (3H,3C)

3424 (ENGL 3424): RUSSIAN LITERATURE IN ENGLISH
Variable-content course devoted to the study of Russian literary classics. Readings and lectures in English. Topics will range from general surveys of 19th century or 20th century Russian literature to more intensive study of the works of a single major author like Tolstoy or Dostoevsky. May be repeated with different content. No knowledge of Russian required. In English. One 2000-level English literature course required. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4204: TOPICS IN RUSSIAN CULTURE AND CIVILIZATION
Specific topics in Russian culture and civilization. Variable content. May be repeated for credit with different content. Pre: 3105. (3H,3C)

4304: STUDIES IN RUSSIAN LITERATURE
Selected masterpieces of Russian literature, read in original. Lectures and discussions in Russian. May be repeated for credit with different content. Pre: 3105. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Spanish Undergraduate Courses (SPAN)

1105-1106: ELEMENTARY SPANISH
Fundamentals of grammar, composition, and oral skills. Readings carefully selected for comprehension and simple conversation. 1105 for students with no high school Spanish; 1106 for students who have completed 1105 or who have less than three years of high school Spanish. (3H,3C) I,II,III,IV.

1114: ACCELERATED ELEMENTARY SPANISH
Condenses SPAN 1105 and 1106. Proficiency-oriented approach to elementary Spanish, designed for learners with some prior experience in the language or for those who wish to progress rapidly through the beginning stages of language learning. Supplemented with a self-instructional electronic component. Meets University and college foreign language requirement. SPAN 1114 duplicates SPAN 1106. (3H,2L,4C) I,II.

2105-2106: INTERMEDIATE SPANISH
Review of grammar with increasing emphasis on reading, writing, and oral communication. X-grade allowed. Pre: 1106. (3H,3C) I,II.

2114: SPANISH FOR AGRICULTURE AND RELATED FIELDS
Vocabulary, idiomatic expressions, and agricultural terminology at the intermediate level. Cultural idiosyncrasies and customs of rural Spanish America. For students with career interests in agriculture, food production, nutrition, veterinary medicine, or rural development. Particularly suited for students following the Agriculture-Home Economics-Foreign Language option in International Studies. May substitute for SPAN 2106 but may not duplicate it for credit. Pre: 2105. (3H,3C)

2154 (HORT 2154): SPANISH FOR THE GREEN INDUSTRY
Dialogue-based language course focusing on the vocabulary and grammatical structures pertaining to Green and Agricultural Industry jobs. Includes vocabulary and context specific to jobs and workers in greenhouse, nursery, turf and landscape environments. Spanish culture is included throughout the course along with grammar and structure. Prior study in Spanish is helpful but not required. I, II. (3H,3C)

2744 (HUM 2744): INTRODUCTION TO SPANISH CULTURE AND CIVILIZATION
Introduction to Spanish culture and civilization from the Middle Ages to the present. Interdisciplinary approach combining the study of literature, the arts, architecture, music, theatre, and film in the context of Spanish cultural history. In English. (4H,3C)

2754 (HUM 2754): INTRODUCTION TO SPANISH-AMERICAN CULTURE AND CIVILIZATION
Spanish-American culture and civilization from the discovery of the New World to the present. Interdisciplinary approach to literature, film, art, architecture, music, and theatre in the context of Spanish-American cultural history. In English. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3104: COMMERCIAL SPANISH
Vocabulary, idiomatic expressions, business letters, and customs common to the Spanish-speaking commercial milieu. For students who would like to apply their language knowledge to careers in the business world. X-grade allowed. Pre: 2106. (3H,3C)

3105,3106: GRAMMAR, COMPOSITION AND CONVERSATION
Practice in communication skills in Spanish both orally and in writing, including review of grammar, directed composition, and conversation, with an emphasis on pronunciation and oral expressions. Not recommended for native speakers of Spanish. X-grade allowed. Pre: 2106. (3H,3C) I,II.

3125-3126: SPANISH FOR ORAL PROFICIENCY
For acquisition of measured levels of proficiency in speaking and understanding spoken Spanish. Content-based instruction in small groups. 3125: to achieve an oral proficiency rating comparable to "Intermediate-high" on the American Council on the Teaching of Foreign Languages Oral Proficiency Interview (ACTFL-OPI) or "S-1+" on the Foreign Service Institute (FSI) scale. 3126: to achieve an oral proficiency rating comparable to "Advanced" on the (ACTFL-OPI) or a "2" on the FSI scale. Admission by oral exam. Pass/Fail only. (3H,3C) I,II.

3304: INTRODUCTION TO HISPANIC LITERATURE
Introduction to Hispanic literature through analysis and discussion of selected major texts from Spain and Spanish America. Methods, terminology, and practice of literary analysis. X-grade allowed. Pre: 3105. (3H,3C) II.

3404: EARLY PENINSULAR CULTURE AND LITERATURE
This course examines Spain's construction of a cohesive national identity as it comes together to form a nation and to become a leading world empire. Exploring the development of Spain from pre-history to the end of the Golden Age in 1700, the class engages diverse literary and cultural texts in dialogue with the key historical and political events of their period in order to provide a greater appreciation of how various cultural media interact with one another in the construction of an overall national identity. Pre: 3304. (3H,3C)

3414: MODERN PENINSULAR CULTURE AND LITERATURE
This course examines Spain's efforts to re-construct itself in the years following the waning of its imperial power. Exploring the development of Spanish identity from 1700 to the present, the class examines diverse literary and cultural texts within the historical, political, and social context in which they were created. The course treats canonical as well as non-canonical texts, from both "high" and "popular" culture, and includes narrative, poetry, theatre, film, art, and architecture. Pre: 3304. (3H,3C)

3434 (ENGL 3434): HISPANIC LITERATURE IN ENGLISH
Variable content course devoted to the study of major works of Spanish and Spanish-American literature in translation. May be repeated with different content. May not be taken for credit toward a major or minor in Spanish. No knowledge of Spanish required. In English. One 2000-level English literature course required. (3H,3C)

3444: EARLY SPANISH-AMERICAN CULTURE AND LITERATURE
This course traces the cultural development of Spanish America from the pre-Hispanic era to independence from Spain in the 19th century. Key literary and cultural texts are examined within the historical, political, and social context in which they were created. The course includes historical texts, narrative, poetry, drama, art, architecture, and music. Pre: 3304. (3H,3C)

3454: MODERN SPANISH-AMERICAN CULTURE AND LITERATURE
This course combines Spanish-American civilization, culture, and literature from the 19th century period of independence to the present. Key literary and cultural texts are examined within the historical, political, and social context in which they were created. The course treats canonical as well as non-canonical texts, from both "high" and "popular" culture, and includes historical texts, narrative, poetry, drama, film, art, architecture, and music. Pre: 3304. (3H,3C)

3684: CROSSING THE BORDER: LIVING THE LITERATURE
Experiential education in the local Latino community through academic readings, community experience, journal reflections, and classroom discussions. Includes 50 hours per semester of interaction with Latino families in their homes, exchanging culture and language with recent immigrants to the New River and Roanoke Valleys. Pre: 2106. (3H,3C)

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4104: ADVANCED GRAMMAR AND STYLE
Analysis of and practice with advanced grammatical and stylistic concepts, including idiomatic and colloquial usage. Intended to help advanced students achieve high levels of proficiency in writing and speaking Spanish. X-grade allowed. Pre: 3105. (3H,3C) II.

4114: TOPICS IN SPANISH LINGUISTICS
Variable content course that surveys linguistic concepts and methods as related to the Spanish language. Topics may include the study of the phonology, morphology, syntax, and semantics of Spanish; the pedagogical application of these language systems; the psychological and social context of language; and the development of Spanish from its origins to its modern form. May be repeated for credit with different content. I Pre: 3105. (3H,3C)

4124: SPANISH TRANSLATION: THEORY AND TECHNIQUE
Introduction to translation theories and application of these theories to different types of texts, including literature, business correspondence, commercial advertising, and legal documents. Includes translation from English to Spanish and from Spanish to English, as well as a thorough review of Spanish grammar and idiomatic language. Pre: 3105. (3H,3C)

4304: STUDIES IN MEDIEVAL AND GOLDEN AGE LITERATURE
A variable content course devoted to Hispanic literature of the Middle Ages and of the Golden Age. The texts selected are studied not only for their aesthetic value but also for their historical and cultural significance. May be taken twice for credit with different content. I Pre: 3404. (3H,3C)

4314: STUDIES IN 18TH AND 19TH CENTURY LITERATURE
A variable content course devoted to Hispanic literature of the 18th and 19th centuries. The texts selected are studied not only for their aesthetic value but also in terms of their historical and cultural significance. May be taken twice for credit with different content. Taught alternate years. I Pre: 3414 or 3444 or 3454. (3H,3C)

4324: STUDIES IN 20TH CENTURY LITERATURE
A variable content course devoted to Hispanic literature of the 20th century. Texts are selected not only for their aesthetic value but also in terms of their historical and cultural significance. May be taken twice for credit with different content. Taught alternate years. Prerequisite 3404 or 3414 for Spain course; 3444 or 3454 for Spanish American course. II Pre: 3414 or 3454. (3H,3C)

4334: SPECIAL TOPICS IN HISPANIC LIFE, LITERATURE, AND LANGUAGE
Broad central themes of Hispanic culture as manifested in creative and historical literature, music, art, film, etc., or in language, such as the history of the Spanish language, translation techniques, or the staging of dramatic works in Spanish. Historical and/or national boundaries are crossed whenever the nature of the topic permits. May be repeated for credit with different content. Taught alternate years. X-grade allowed. Pre: 3404 or 3414 or 3444 or 3454. (3H,3C) II.

4344: SPANISH-AMERICAN LITERATURE AND THE REPRESENTATION OF HISTORY
This is a variable content course that allows students to explore different geographical regions of Spanish America and the ways that authors have used literature to preserve, recreate, revise, subvert, and even contradict their countries' official history. All discussion conducted in Spanish. May be repeated for credit up to three times with different content. Pre: minimum oral proficiency of "Advanced" on the ACTFL scale; at least one prior 4000-level course in Hispanic literature, or consent. (3H,3C)

4794: SENIOR TUTORIAL IN SPANISH STUDIES
Individual or small group sessions which give the student the opportunity to hone special language skills, with a focus on post-graduation application of these skills. May concentrate on areas such as technical or business language, linguistics, translation, interpreting, creative writing, specialized literary, or cultural studies. May be taken twice for credit with different content. Must be pre-arranged three weeks before end of previous semester. One 4000 level Spanish course required. Restricted to Seniors. Restricted to Spanish majors. Consent of Spanish Section required. (1H,1C) I,II,III,IV.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

Liberal Arts and Human Sciences

History

www.history.vt.edu/index.htm

Daniel B. Thorp, Chair
Distinguished Professor: J. I. Robertson, Jr.
Professors: L.J.Arnold; F.J. Baumgartner; W.C. Davis; A.R. Ekirch; R.F. Hirsh; C.A. Shifflett; P.R. Wallenstein
Associate Professors: M.V. Barrow, Jr.; G.R. Bugh; B. Bunch-Lyons; E.T. Ewing; H. Farrar; K. Jones; M. Mollin; A. Nelson; P. Schmitthenner; N.L. Shumsky; R. Stephens; D.B. Thorp
Assistant Professors: H. Gumbert; M. Heaton; D. Hidalgo; H. Schneider; B. L. Shadle
Adjunct Professors: G. Becker; A. F. Laberge; B.J. Reeves; A. Schuetz; S. Watkins; T. Watkins

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Overview

The study of history enables students to learn about the people and events of the past. In the process, it also helps them develop their ability to think logically, to conduct research, and to analyze the various ways in which the past continues to shape the present.

The history curriculum prepares students for graduate or professional schools; positions in teaching, business, or government; and a variety of other careers. Faculty advisors are available to consult with students regarding career choices, education certification, and internships, as well as to provide assistance in planning general academic progress. An honors program is offered for outstanding history majors.

Courses at the 1000 level are introductory surveys open to anyone with an interest in history but without a strong background in the subject. Students intending to continue in history should take these courses in their freshman or sophomore years. Courses at the 2000 level, with the exception of Historical Methods, are national surveys for a general undergraduate audience. Courses at the 3000 level, primarily for sophomores and above, provide more focused and detailed study of a period, place, or topic introduced at the 1000 or 2000 level. Courses at the 4000 level are conducted as seminars that emphasize original writing and research, and are generally restricted to students with junior standing or above who have already taken six hours or more of college-level history.

In addition to fulfilling the requirements of the Curriculum for Liberal Education, history majors must complete 39 hours of course work in history including: no more than nine hours at the 1000 level (all of which must be taken before the senior year); History 2004 (must receive a "B-" or better if no option is chosen; "B" or better if one of the four options is selected); at least 24 hours of course work at the 2000 or 3000 levels distributed among the four groups identified on the department's Information Sheet for Majors (available at the departmental office or on the department's Homepage); three hours of course work at the 4000 level.

Majors may select a concentration within the history major. Concentrations require that at least 12 of the 24 hours of history taken at the 2000 or 3000 level be appropriate to the field of concentration, and the completion of 6 hours of undergraduate research. Concentrations are available in: Military/Political/Diplomatic History; Social/Cultural/Economic History; Global/Comparative History; and History of Science/ Technology/Environment.

A faculty advisor and/or professional advisor will assist each major in planning a suitable course of study. The student is expected to confer with the faculty advisor at regular intervals regarding the progress of his or her studies.

To earn a minor in history, a student must complete satisfactorily (with at least a 2.0 average) a minimum of 18 hours of history courses. These 18 hours must include at least three hours of credit from each of three of the four groups of history courses identified on the Information Sheet for Majors. For purposes of the minor, History 1115 and 1116 may be considered as Group I credit; History 1024, 1025, and 1026 may be considered as Group II credit; and History 1214 and 1224 may be considered as Group III credit. At least six of the 18 hours must be on the 2000 level or above, and at least six more of the 18 hours must be at the 3000 level or above. Students must have a minimum 3.0 overall GPA to enter the minor.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics") and toward the degree in history.

Satisfactory progress toward the B.A. in history requires that:

- Upon having attempted 18 semester credits of history, must have an in-major GPA of 2.5 or above
- Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

HIST 2004: Historical Methods (with grade of "B-" or above)	3
History electives	12
Total Credits	**(15)**

- Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.
- Students must earn a C- or above for a history course to count toward their major requirements.

Major Restrictions

History is a restricted major. The criteria for entering the major include: a) Completion of first-year writing requirement (ENGL 1105-06, COMM 1015-16, or ENGL 1204H) with an average GPA of 2.5; b) completion of 9 semester credits of history at Virginia Tech, with an average GPA of 2.5 or above in those classes; c) minimum of 2.0 GPA overall; 4) applicants are considered on a competitive GPA and space available basis. Secondary majors and minors must have a minimum 3.0 GPA overall to enter the major or minor.

Undergraduate Courses (HIST)

1004: INTRODUCTION TO THE HISTORY OF THE UNITED STATES
A thematic approach to the history of the United States from pre-independence to the present. Major themes, developed within broad chronological units, will include: the contours of political democracy, and civic culture; the rise of an industrial, corporate, and global economy; territorial expansion and increasing involvement in world affairs; the impact of science and technology on public policy and daily life; the relationship between religion and society; and the development of a multicultural America. This course fulfills the university requirement for proficiency in American History. Partially duplicates 1115 and 1116. No credit will be allowed for duplicating courses. (3H,3C)

1014 (AAEC 1014): SURVEY OF AMERICAN ECONOMIC HISTORY
Overview of the major themes in the transformation and change of the United States economy and the economic life of its citizens from the colonial period to the present. Economic growth and change are described within contemporary social, political and cultural contexts. Broad themes include the transformation of an agrarian economy into an industrial economy, the changing nature of work, the role of government in the economy, and the performance of the economy over time. (3H,3C)

1024: ANCIENT HISTORY
History of the ancient world from the invention of writing after 10,000 BC to the fall of the Roman Empire in the fifth century AD. Surveys the civilizations of the Ancient Near East (including Egypt and Anatolia), Greece, and Rome. (3H,3C)

1025,1026: INTRODUCTION TO EUROPEAN CIVILIZATION
Significant problems and processes in the history of Europe from the Middle Ages to the recent past. 1025: From Medieval society to the mid-18th century; 1026: Mid-18th-century to the recent past. Sequence is recommended in preparation for advanced courses in European history. (3H,3C)

1115,1116: HISTORY OF THE UNITED STATES
Stresses fundamental facts and interpretations in American history. 1115: 1607 to Civil War; 1116: Civil War to present. Sequence is recommended preparation for advanced courses in American history. Students who have taken 1004 may not take 1115 or 1116 for credit. (3H,3C)

1214: HISTORY OF THE MODERN WORLD
An examination of the global significance of the critical political, social, cultural, and international issues in the 20th century. (3H,3C)

1224: INTRODUCTION TO LATIN AMERICA
The peoples of Latin America from the earliest times to the present. Historical approach to understanding ancient and contemporary cultures, their environmental impact, and their socio-political dynamics from Mexico to Tierra del Fuego over 5000 years. (3H,3C)

2004: HISTORICAL METHODS
Explanation of the discipline of history: its history, philosophies, and methods, with emphasis on historical research. (3H,3C)

2054 (STS 2054): ENGINEERING CULTURES
Development of engineering and its cultural roles in historical and cross-national perspectives. Explores roles of engineers and engineering in popular life, development of national styles, changing values in engineering problem solving, and effects of evolving forms of capitalism. (3H,3C)

2104H: CRITICAL ISSUES IN AMERICAN HISTORY
This course allows Honors students to explore more thoroughly selected themes in the history of the United States, from its initial settlement to the present. Students must have University Honors status or permission of the instructor to take this course. (3H,3C)

2114H: CRITICAL ISSUES IN EUROPEAN HISTORY
An exploration of critical issues in modern European history, through the study of source materials and historical interpretations. University Honors standing is required. (3H,3C)

2124: CRITICAL ISSUES IN WORLD HISTORY
An examination of significant themes and important topics in world history from the fifteenth century through the present. (3H,3C)

2155,2156: HISTORY OF ENGLAND
Development of English culture, society, and institutions from the Anglo-Saxon invasions to the present. Stress on the growth of law, government, and the constitution. 2155: 450 A.D. to 1702; 2156: since 1702. (3H,3C)

2165,2166: HISTORY OF FRANCE
French history from Roman Gaul to the present. 2165: Roman, Medieval, and Renaissance France; Absolute Monarchy. 2166: The Revolution; Nineteenth and Twentieth Century France. (3H,3C)

2184: HISTORY OF THE BALKANS
History of Southeastern Europe from the sixth century to the present. Chief themes are movement of peoples, Byzantine and Ottoman Empires, religious conflicts, social developments, and rival nationalisms. Taught alternate years. (3H,3C)

2304: AFRICA IN THE MODERN WORLD
The peoples and societies of Africa. Emphasis on major themes and developments since the eighteenth century. Historical approach to understanding indigenous African cultures and their encounters with global forces. Concentration on African achievements, the response to colonialism, the rise of modern nationalism, and the problems and prospects of independent Africa. Taught alternate years. (3H,3C)

2345,2346: HISTORY OF THE MIDDLE EAST
History of the Middle East from the seventh century to today, with emphasis on formation of Islamic civilization, medieval and early modern political systems, European imperialism, and the struggle for independence. 2345: seventh century to 1914; 2346: independence, wars, revolutions, and social change since 1914. (3H,3C)

2355,2356: HISTORY OF CHINA
China from prehistory to the present. Special attention to political, social, economic, and cultural developments. 2355: Prehistory, Imperial China to the sixteenth century; 2356: late Imperial China to modern and contemporary China. (3H,3C)

2364: HISTORY OF JAPAN
Political, social, economic, and cultural development of Japan from earliest times to present; emphasis on problems of modernization in the nineteenth and the twentieth centuries. (3H,3C)

2375,2376: HISTORY OF THE INDIAN SUBCONTINENT
History of the Indian subcontinent (South Asia) from ancient times to the present, with special emphasis on cultural developments. 2375: Development of traditional South Asian civilization from ancient times to 1500; 2376: Development of modern South Asian civilization since 1500. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2984H: SPECIAL STUDY
Variable credit course.

3004: COLONIAL AMERICA
Critical analysis of early American society. Founding and development of the colonies in the 17th century; 18th century colonial life. (3H,3C)

3014: AMERICAN REVOLUTION
Causes, nature, and results of the American Revolution, 1763- 1789. (3H,3C)

3024: THE EARLY UNITED STATES
A study of social, political, and economic developments in the United States between 1790 and 1845 with special emphasis on the Industrial and Transportation Revolutions in the North and Old Northwest. Taught alternate years. (3H,3C)

3055,3056: CIVIL WAR AND RECONSTRUCTION
Causative forces leading to war, political, military, and social study of the Civil War, with emphasis on the Southern Confederacy; the levying and legacy of Reconstruction. 3055: 1820-1862; 3056: 1862-1877. (3H,3C)

3064: EMERGENCE OF MODERN AMERICA, 1877-1917
American from end of Reconstruction to World War I: industrial and urban growth, the last frontier, worsening status for blacks, immigration and new ethnic currents, Populism and Progressivism, cultural ferment, and overseas expansion, America's entry on the world stage. Taught alternate years. (3H,3C)

3084: RECENT AMERICA, 1917-PRESENT
Social, economic, cultural, and political history of America from the entry into World War I, the turbulent 1920's, the Great Depression, the New Deal, World War II, postwar prosperity, the Cold War, social and cultural ferment, Vietnam, Watergate, to the new anxieties about the limits of power in the 1980's. Taught alternate years. (3H,3C)

3104: UNITED STATES SOCIAL HISTORY
Examination of the lives of ordinary people in order to understand the human experience through a focus on race, ethnicity, class, gender, and region. (3H,3C)

3105,3106: WOMEN IN U S HISTORY
Roles of women from colonial settlement to the present. Special attention to family experiences, political agendas, and economic contributions of women and to social construction of gender identities. 3105: to 1865; 3106: since 1865. (3H,3C)

3114: UNITED STATES BUSINESS HISTORY
Survey of U.S. business history from colonial times through the present. Formation of business institutions, specialization of commercial functions, rise of big business, and development of oligopolies, conglomerates, and multinational corporations. Taught alternate years. (3H,3C)

3124: HISTORY OF AMERICAN AGRICULTURE
Changes in farming and the relation between farming and society, politics, and economics. Stresses development of modern agriculture in America. (3H,3C)

3134: SPORTS IN AMERICAN HISTORY
Impact of sports in American history. Emphasis on the impact of team sports (college and professional basketball, baseball, and football) and individual sports (golf, boxing, and automobile racing) have had on the development of American society and culture. (3H,3C)

3144: AMERICAN ENVIRONMENTAL HISTORY
Changing attitudes about nature and wilderness, political decisions, supervisory institutions, and environmental problems that accompanied utilization of America's natural resources. (3H,3C)

3155,3156: HISTORY OF AMERICAN CITIES
Growth and development, form and functioning of American cities from the settlement of the country to the present. 3155: 1565 to 1870. 3156: 1870 to the present. (3H,3C) I,II.

3164: SEXUALITY IN AMERICAN HISTORY
This course introduces students to how the meaning and place of sexuality in American life have changed from the colonial era through the present, with a focus on the dynamics of race, ethnicity, gender, and class. (3H,3C)

3174 (AFST 3174): AFRICAN AMERICAN MEN IN UNITED STATES HISTORY
Chronological and thematic examination of significant historical moments in black men's lives. Examination of the social, cultural, and political forces contributing to a uniquely African American male experience in the United States. Survey of events in America's collective past such as wars, depressions, and protest movements. (3H,3C)

3175,3176 (AFST 3175, 3176): AFRO-AMERICAN HISTORY
The Afro-American experience in the United States from 1619 to the present. Emphasis upon slavery and the strategies of economic and social survival in the twentieth century. 3175: 1619-1877. 3176: 1877-present. (3H,3C)

3184: HISTORY OF UNITED STATES FOREIGN RELATIONS
American foreign relations with emphasis on the twentieth century and American globalism, domestic influences on foreign policy and interrelationships between foreign and domestic events and ideas. (3H,3C)

3205,3206: U.S. SOUTH
The southern experience from Old to New South with emphases upon racial accommodation, social hierarchy, cultural identity, political struggle, and intellectual change. 3205: to 1900; 3206: since 1900. (3H,3C)

3214: HISTORY OF APPALACHIA
Early settlement, religion, the pre-industrial economy, the coming of the coal and lumber industries, labor activism, politics, migration, and regional identity. (3H,3C)

3224: HISTORY OF VIRGINIA
Social, political, cultural, and economic developments in Virginia, from the sixteenth century to the present. (3H,3C)

3234: THE NORTH AMERICAN WEST
A study of the peoples and history of the North American West from the sixteenth century through the twentieth. Taught alternate years. I (3H,3C)

3254: THE VIETNAM WAR
A critical study of the causes and consequences of the Vietnam War, 1945-1975. Analysis of America's strategic and military objectives, the nature and conduct of the war, and the growth of the antiwar movement at home. (3H,3C)

3264: THE UNITED STATES IN LATIN AMERICA
U.S. political and economic relations with the Latin American republics. Analysis and discussion of the history of formal and informal U.S. diplomacy, military intervention, and economic interests in Latin America during the nineteenth and twentieth centuries. Taught alternate years. (3H,3C)

3274: THE GREEK CITY
History of the ancient Greek city-state (polis) from the Archaic period (800-500 BC) to the creation of the Roman Empire. Principal topics are: origins and definition of the polis; Greek colonization throughout the Mediterranean and Black Seas; the struggle for autonomy in the Classical and Hellenistic periods; and the Hellenizing impact of the polis on non-Greek populations. Taught alternate years. (3H,3C)

3284: THE ROMAN REVOLUTION
History of the Roman world from 264 B.C. to A.D. 180. Particular attention to the three themes of imperialism, revolution, and empire through extensive reading of the contemporary authors. Taught alternate years. (3H,3C)

3304: THE WORLD OF ALEXANDER THE GREAT
The life and times of Alexander the Great, 431 to 323 B.C., and the new cosmopolitan world initiated by his conquests, 323 to 30 B.C. Taught alternate years. (3H,3C) II.

3314: THE LATER ROMAN EMPIRE
Roman Empire in the west from A.D. 180 to A.D. 476 and in the east from A.D. 476 to A.D. 1071. Particular attention to the causes of the fall of the empire in the west and to the Byzantine Empire in the east until the coming of the Turks and the Christian Crusaders. Taught alternate years. (3H,3C)

3324: THE MEDIEVAL WORLD
Characteristic thought and institutions of high and late Middle Ages. (3H,3C)

3334: THE RENAISSANCE
The Italian Renaissance in its European context. Emphasis upon the culture and institutions of Italian states from 1300 to 1500. (3H,3C) II.

3344: THE ERA OF THE REFORMATION
Development of Protestantism and reformation of the Catholic Church from 1500 to about 1600. Emphasis upon social, political, and economic factors as well as theology. Examination of conflicts engendered by the reformation movements. Taught alternate years. (3H,3C)

3364: THE AGE OF REVOLUTION AND NAPOLEON
The French Revolution in its European and global context, with particular attention to social and political causes of unrest, strategies of popular mobilization, debates about authority and order, the emergence of empires, and the long-term implications of revolutionary change. (3H,3C)

3384: EUROPE AND WORLD WAR I
European politics and society before and after World War I. Emphasis on industrialism, imperialism, and the conflicts which they engendered; total war and its aftermath; economic dislocation; strains upon democracy; Fascism, Communism, and the totalitarian state. Taught alternate years. (3H,3C)

3394: EUROPE SINCE WORLD WAR II
Europe's political and economic recovery since 1945; development of the "Cold War"; Soviet Union and Eastern Europe before and after Stalin; Western European integration and development of a consumer society; Ostpolitik and Detente; decolonization and neo-colonialism; Europe's position in the world economy, dependence on imported materials and energy; the Revolutions of 1989 and post-Marxist Eastern Europe. Taught alternate years. (3H,3C)

3424: TUDOR AND EARLY STUART ENGLAND, 1509-1660
Causes and consequences of the English Reformation and subsequent Civil War. Decline of royal power and increasing importance of Parliament. Cultural and intellectual developments of the Elizabethan period. (3H,3C)

3434: LATE STUART AND EIGHTEENTH-CENTURY ENGLAND
Causes and consequences of the Glorious Revolution, the early Industrial Revolution, and the War of the American Revolution. Establishment of cabinet government and office of Prime Minister. Cultural and artistic developments of the period. (3H,3C)

3484: TWENTIETH-CENTURY GERMANY
Political, social, economic, and cultural history of twentieth-century Germany. Taught alternate years. (3H,3C)

3494 (JUD 3494): THE HOLOCAUST
This course provides a historical account, a psychological analysis and an occasion for philosophical contemplation on the Holocaust. We will examine the deliberate and systematic attempt to annihilate the Jewish people by the National Socialist German State during World War II. Although Jews were the primary victims, Gypsies, the handicapped, homosexuals, Jehovah's Witnesses and political dissidents were targeted, we will discuss their faith as well. The class will be organized around the examination of primary sources: written accounts, photographic and film, and personal testimony. Alternate years. (3H,3C)

3505,3506: EUROPEAN DIPLOMATIC HISTORY
Diplomacy and war among European powers. 3505: Development of the European States System, 1589-1848; 3506: Diplomacy of nation states, 1848-present. Taught alternate years. (3H,3C)

3514: THE AGE OF EXPLORATION AND CONQUEST
Technological, political, and economic factors that brought about the European exploration of the world from 1450-1770 and the conquest of much of

it. The impact of those events on both Europe and the world. Taught alternate years.
(3H,3C)

3524: EUROPEAN MILITARY HISTORY TO 1789
Analysis of change in warfare from the ancient Greeks to the French Revolution. Emphasis on the social and technological causes of military change. (3H,3C)

3534: MODERN MILITARY HISTORY
Evolution of warfare in its political and social setting since the French Revolution. Discussion of both European and American military institutions. (3H,3C)

3544: WORLD WAR II
Causes, course, and results of World War II. Emphasis upon diplomacy and the social impact of total war as well as military events. Coverage will stress the world-wide nature of the war. (3H,3C)

3554: AGE OF GLOBALIZATION
An examination of historical forces in the late twentieth century, including economic trends, ideological forces, social structures, and political relations, that have shaped patterns of globalization. (3H,3C)

3565,3566: HISTORY OF THE CHURCH
The Christian Church from the earliest times to the present. 3565: The early and medieval periods. 3566: The modern period. Taught alternate years. (3H,3C)

3574: WOMEN IN EUROPEAN HISTORY
Women's historical experience and social roles, attitudes toward women, and the development of feminist thought and activity in Europe since 1500. Taught alternate years. (3H,3C)

3584: COLONIAL LATIN AMERICA
Major themes and issues in Colonial Latin American History. Discussion of the Spanish and Portuguese empires in the western hemisphere, emphasizing indigenous responses to colonization, the privatization of land and labor, the Church and village as financial and cultural institutions, imperial policies and reforms, and the collapse of empire after 300 years. I (3H,3C)

3594: THE RISE OF MODERN LATIN AMERICA
Major themes and issues in Modern Latin American History. Discussion of the rise of Latin American nations, stressing the internal and external challenges new republics confronted during the nineteenth century and the opportunities and conflicts of the twentieth century. (3H,3C)

3604: RUSSIA TO PETER THE GREAT
Russian history from the founding of Russia in the ninth century to the reign of Peter the Great in the early eighteenth century, with special attention to political developments, changes in society and culture and regional context. (3H,3C)

3614: IMPERIAL RUSSIA
Russian history from Peter the Great to the Revolution of 1917, with special attention to political developments, changes in society and culture, and the impact of the regional context. (3H,3C)

3644: TWENTIETH-CENTURY RUSSIA
The history of the Soviet Union from 1917 to the present, with particular emphasis on collectivization, industrialization, ideology, international relations, and other factors that have determined the peculiar character of the Soviet state. Taught alternate years. (3H,3C)

3654: THE ARAB-ISRAELI DISPUTE
Historical origins and development of the struggle for Palestine. Emphasis on post-WW II including conflicting nationalisms, wars, history of Israel, and Great Power diplomacy. (3H,3C)

3664: REVOLUTIONARY CHINA
Ideological and institutional development of the Chinese Communist movement since 1920; emphasis on problems of historical change in modern China. (3H,3C)

3684 (HUM 3684): CULTURAL HISTORY OF THE SOVIET UNION AND THE SUCCESSOR STATES
History and main characteristics of cultural life and the arts in the former Soviet Union, with emphasis on film, music, literature, and the relationship between elite and popular culture. Taught alternate years. (3H,3C)

3694: HISTORY THROUGH FILM
This course introduces students to critical issues in history and representation, utilizing film to analyze central historical issues. The specific thematic content is variable. Course may be repeated for up to 9 credits. (3H,3C)

3705,3706 (STS 3705, 3706): HISTORY OF SCIENCE
Conceptual and institutional development of physical and biological sciences viewed within a cultural and societal context. 3705: Early Science; 3706: Modern Science. (3H,3C)

3715,3716 (STS 3715, 3716): HISTORY OF TECHNOLOGY
Description of the development of technology and engineering in their social contexts. 3715: From prehistory to the industrial revolution in Europe and the United States, mid-19th century. 3716: From mid-19th century to the present.
(3H,3C)

3724: HISTORY OF DISEASE, MEDICINE, AND HEALTH
Development of Western concepts of disease, medicine, and health with emphasis on period from eighteenth century to present. Social construction of disease and relationship between health and social, economic, and political structures. Special attention to impact of public health and the development of scientific and technological medicine. (3H,3C)

3734 (STS 3734): HISTORY OF MODERN BIOLOGY
This course explores the development of biology from the Enlightenment to the end of the twentieth century, with a particular emphasis on biology's impact on society. (3H,3C)

3744: SOCIAL HISTORY OF FILM
This course introduces students to critical issues in the social history of film, examining the production and consumption of film in specific historical moments as well as the effects of film on society, culture, and politics. The specific thematic content is variable. May be repeated with different content for a maximum of 9 credits. (3H,3C)

4004: TOPICS IN SOCIAL AND CULTURAL HISTORY
Selected topics in social and cultural history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4014: TOPICS IN WAR, REVOLUTION AND DIPLOMACY
Selected topics in the roles of war, revolution, and diplomacy in human history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4024: TOPICS IN COLONIALISM AND IMPERIALISM
Selected topics in colonialism, imperialism, and de-colonization. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4034: TOPICS IN ECONOMIC AND BUSINESS HISTORY
Selected topics in economic and business history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4044: TOPICS IN WOMEN'S HISTORY
Intensive study of selected topics in women's history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4054: TOPICS IN POLITICAL HISTORY
Selected topics in the role of politics in history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4064: TOPICS IN RACE AND ETHNIC HISTORY
Selected topics in the role of race and ethnicity in human history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4074 (REL 4074): TOPICS IN RELIGIOUS AND INTELLECTUAL HISTORY
Selected topics in the role of religion and intellectual systems in human history. May be repeated with different content. 3 other hours of history and junior standing or above required. Pre: 2004. (3H,3C)

4214: TOPICS IN THE HISTORY OF SCIENCE, MEDICINE AND TECHNOLOGY
Selected topics in the history of science, medicine and technology. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4224: TOPICS IN LEGAL AND CONSTITUTIONAL HISTORY
Selected topics in legal and constitutional history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4234: TOPICS IN AFRICAN-AMERICAN HISTORY
Selected topics in African-American history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4244: TOPICS IN ENVIRONMENTAL HISTORY
Selected topics in environmental history. May be repeated with different content. 3 other hours of history and junior standing required. Pre: 2004. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Human Development

www.humandevelopment.vt.edu/
E-mail: hdd@vt.edu

Shannon E. Jarrott, Department Head
Alumni Distinguished Professor: R. Blieszner
Professors: K. R. Allen; M. Boucouvalas; V. R. Fu; J. A. Mancini; E. E. McCollum; P. S. Meszaros; F. P. Piercy; K. A. Roberto
Associate Professors: J. A. Arditti; M. J. Benson; A. L. Few; A. J. Huebner; S. E. Jarrott; S. W. Johnson
Assistant Professors: C. Kaestle; M. L. Dolbin-MacNab; M. Falconier; M. L. Keeling; K. J. Kim; C. L. Smith; J. Savla, A. Wittenborn
Senior Instructor: M.E. Verdu
Advanced Instructor: A. Galway
Instructor: K.Gallagher; I. Schepisi; L.A. Wolf
Adjunct Faculty: J. E. Garrison, Jr.; C. Hudgins; C. Rogers

Overview

The Department of Human Development offers undergraduate study of family relationships and of human development across the lifespan. The department's mission is to understand and improve the lives of people of all ages in relationships, families, organizations, and communities. The Human Services option leading to the B.S. prepares students for a variety of professional careers.

The program participates in the University Honors Program.

The department offers graduate programs leading to the M.S. in applied human development at the Blacksburg campus, and adult learning and human resource development as well as marriage and family therapy at the National Capital Region campus. The department also offers graduate programs leading to the Ph.D. in adult development and aging, adult learning and human resource development, child and adolescent development, family studies, and marriage and family therapy. Graduate students can earn the Graduate Certificate in Gerontology along with their degree or as Commonwealth Campus students (for more information, contact the Center for Gerontology, 237 Wallace Hall, 540/231-7657). (See Graduate Catalog)

Human Services

Career Advisors: M. E. Verdu
The Human Services Option is for students interested in a wide variety of careers and graduate school programs. The option provides undergraduate majors with a theoretical and experiential grounding in child and adult development and in family and relational dynamics. Course work includes emphases on how individuals and families develop over the life cycle, on the critical issues and events that influence families, and on family transitions and dynamics. The curriculum also focuses on human sexuality, family diversity, and social and public policies that affect individuals and their families. Through course work and field placement experiences, human services students develop and practice skills and communcation techniques for working with individuals, families and groups. In addition to course work with the Department of Human Development, human services students take courses in the areas of psychology, sociology, biology, statistics and mathematics, writing and communication, family economics, creative arts, cultural traditions, and international perspectives on human concerns. Students may tailor their studies to their particular professional goals and interests through the use of free electives.

The field study, which integrates theory, research and practice, is a pivotal experience in students' career development. It increases students' communication and practice skills and helps narrow career interests. Careers open to human services graduates include: preschool, elementary, family & consumer science and special education, employment and job training services, health and wellness programs, housing services, income programs, mental health services, nutrition and meals programs, protective services, recreation programs, respite services, social services, substance abuse programs, volunteer programs, and child care services. Graduate and professional options that human services graduates may consider include business, community health and public health, law, education, family studies, gerontology, marriage and family therapy, medicine and nursing, psychology and sociology, public administration, rehabilitation, and social work.

A. Required (55 credits) for students graduating in 2011 in tracks: Child & Adolescent, Family Gerontology or Professional Helping Skills	
COMM 2004: Public Speaking	3
HD 1004: Human Development I: Childhood and Adolescence	3
HD 2004: Human Development II: Adulthood and Aging	3
HD 2335-2336: Principles of Human Services	3-3
HD 2304: Family Relationships	3
HD 2314: Human Sexuality	3
HD 3014: Research Methods in H.D.	3
HD 3304: Advanced Helping Skills	3
HD 4324: Individual & Family Risk & Resilience	3
HD 4354: The Family, Law, and Public Policy	3
HD 4364: Gender and Family Diversity	3
HD 4374: Parent Education and Practice	3
HD 4714: Senior Capstone	3
HD 4964: Field Study	6
AHRM 2304: Family Financial Management ***or*** AHRM 2404: Consumer Rights	3
STAT 3604: Statistics for the Social Sciences	3
LAHS 3004: Professional Seminar	1
B. Tracks: select one: Child & Adolescent; Family Gerontology; Professional Helping Skills (9-12 credits)	
Students are encouraged to consider the wide array of courses across the university curriculum as potential choices for electives to support their Human Services major. In consultation with the major advisor, each student should confirm that prerequisite requirements have been met before enrolling in elective courses. Courses used in Section A cannot be counted again in Section B.	
C. Free Electives (Select 23-28 credits)	
Students are encouraged to consider the wide array of courses across the university curriculum as potential choices for electives to support their Human Services major. In consultation with the major advisor, each student should confirm that prerequisite requirements have been met before enrolling in elective courses. Courses used in Section A cannot be counted again in Section B.	
Total Credits	**120**
Note: Please consult the appropriate catalog course list or the departmental checksheet for prerequisites to required courses.	

Satisfactory Progress

A student will be considered to have made satisfactory progress toward the degree when he/she has successfully completed the Curriculum for Liberal Education requirements for English, mathematics, and biology, and HD 1004, by the time the student has attempted 72 semester credits.

Course Descriptions (HD)

1004: HUMAN DEVELOPMENT I: CHILDHOOD AND ADOLESCENCE
Basic concepts related to normal human development. Emphasis on developmental theories and principles of growth, development, and behavior of children from conception through adolescence. Designed as a general survey course for majors and non-majors. (3H,3C) I,II.

1115-1116: INTRODUCTION TO THE EDUCATION PROFESSION I
Orientation to early childhood and elementary education profession. 1115: Issues in development of professional identity and functioning in a university community of learners; historical overview. 1116: Current issues in education. This course is restricted to students in the Early Childhood Education option. (1H,1C)

2004: HUMAN DEVELOPMENT II: ADULTHOOD AND AGING
Introduction to adult development and aging (gerontology). Basic concepts, principles, and issues of development across the adult years. Pre: 1004.

(3H,3C)

2115-2116: INTRODUCTION TO THE EDUCATION PROFESSION II
Continuation of HD 1115-1116. Integration of personal and professional identify status, home-school relations, alternative education models. This course is restricted to students in the Early Childhood Education option. Pre: 1115, 1116 for 2115; 2115 for 2116. (1H,1C)

2304: FAMILY RELATIONSHIPS
Overview of basic concepts, principles, theories, and issues of development and change in family relationships. Topics include families in historical and contextual perspective, structural and relational diversity in families, and processes of relational development, maintenance, and dissolution in families. (3H,3C)

2314: HUMAN SEXUALITY
Explores the diversity of human sexuality using global perspectives. Biological, historical, developmental, psychological, and sociological approaches frame this interdisciplinary examination of the social constructions of sexuality, the processes of gender stratification, and the development of sexual practices, rituals, mythologies, and belief systems across time and around the world. (3H,3C)

2335-2336: PRINCIPLES OF HUMAN SERVICES
2335: Basic concepts, techniques, and structure of the human services profession. Survey of client/family assessment and problem management.
2336: Advanced topics in human services focusing on: case management, crisis intervention, program administration, specialized interventions, ethics, and professional development. Pre: 1004 for 2335; 2335 for 2336. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course. X-grade allowed.

3014: RESEARCH METHODS IN HUMAN DEVELOPMENT
Critical thinking and problem-solving involved in applying methods of scientific inquiry to the field of human development. Topics include methods of data collection, basic methods for displaying and analyzing data, and writing reports. Pre: 2004, 2304, STAT 3604. (2H,1L,3C)

3114: ISSUES IN AGING
Seminar which investigates selected contemporary issues in adulthood and old age, such as family and friend relationships; work and retirement; political, legal, and economic issues; and women's concerns. (3H,3C) I,II.

3144 (EDCI 3144): EDUCATION OF EXCEPTIONAL LEARNERS
Emphasizes legal, ethical, and economic bases, assessment and eligibility requirements, characteristics and educational implications, and practices pertaining to various exceptionalities. (3H,3C)

3204: PRINCIPLES OF WORKING WITH CHILDREN AND PARENTS
Principles and techniques of guiding children's behavior will be studied from a developmental perspective. Parent education methods will be explored. Pre: 1004. (2H,3L,3C) I,II.

3214: INFANCY AND EARLY CHILDHOOD
Theories, principles, normal patterns of physical, cognitive, social, and emotional development from conception to the early school years. Micro and macro environmental influences on development are considered as they interact with genetic/biological determinants of development. Pre: 1004. (3H,3C)

3224: MIDDLE CHILDHOOD AND ADOLESCENCE
Theories, principles, normal patterns of physical, cognitive, social, and emotional development from middle childhood to adolescence. Micro and macro environmental influences on development are considered as they interact with genetic/biological determinants of development. Pre: 1004. (3H,3C)

3234: CHILD/YOUTH COMMUNITY SERVICES
Health and human service programs serving children, youth, and families. Overview of child/youth, care issues, methods of determining service eligibility, and procedures for maintaining quality assurance. Pre: 1004, 2304. (3H,3C)

3304: ADVANCED HELPING SKILLS
Helping skills used in human services settings. Case management, evaluating crisis situations, and approaches to individual and family assessment. Pre: 2335, 2336. (3H,3C)

3334: INDIVIDUAL AND FAMILY INTERVENTIONS
Focus on intervention approaches used in human services settings. Provides students with an introduction to theories of individual, couple, family, and group intervention. Students will apply course material to case scenarios. Topics include theories of intervention, developmentally appropriate interventions, and methods for addressing diversity. Students will be introduced to intervention strategies used in a variety of human services settings. Students with Graduate standing are not required to take the pre-requisite HD 2004. Pre: 3304. (3H,3C)

3344: SOCIO-HISTORICAL DEVELOPMENT OF THE FAMILY
Description and analysis of the process of change in American family patterns. (3H,3C) I,II.

3464 (AHRM 3464) (EDHL 3464) (GEOG 3464) (HUM 3464) (SOC 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. (2H,3L,3C)

4114: COMMUNITY BASED SERVICES FOR OLDER ADULTS
Introduces students to the health and human services programs that comprise the community-based long term care system. Topics include an overview of the continuum of community programs and services for older adults, methods to determine service eligibility, and procedures for maintaining quality assurance. Prerequisite or graduate standing is required. Pre: 2004. (3H,3C)

4224: ADMINISTRATION OF CHILD DEVELOPMENT PROGRAMS
Addresses issues, functions, and responsibilities involved in developing and implementing child care programs. Included are types of programs, staffing, scheduling, environmental design, equipment, evaluation, and financing. Pre: 3204, 4214. (3H,3C) II.

4235-4236: CURRICULUM AND ASSESSMENT
Basic concepts, principles and issues of curriculum and assessment are explored in the real context of teaching and learning with young children. Supervised experience in observation, reflection, assessment, planning, implementing and evaluating activities and experiences consistent with developmental abilities and interests of children is provided. Pre: 1004, 4964 for 4235; 4235 for 4236. Co: 4964 for 4235. (3H,3C)

4304: HUMAN SERVICES ADMINISTRATION
Issues, functions, and responsibilities involved in developing, implementing, and evaluating family and human services programs. (3H,3C)

4324: INDIVIDUAL AND FAMILY RISK AND RESILIENCE
Investigation of challenges, stresses, and crises experienced by individuals and families; protective factors and resilience; coping strategies; prevention and intervention. Pre: 2304. (3H,3C)

4334: PERSPECTIVES ON ADDICTION AND FAMILY SYSTEMS
Intra-personal and inter-personal dimensions of compulsive- addictive patterns manifested in the context of the family system. Reciprocal interaction between families and other systems. Junior standing required. Pre: 2304 or 2314. (3H,3C) I,II.

4354: FAMILY, LAW, AND PUBLIC POLICY
Theoretical and substantive issues that relate to the development and implementation of family policies. Implications of political culture and family legislation for the well-being of children and their families. Pre: 1004, 2335, 2336, 2004, 2304. (3H,3C) I,II.

4364: GENDER AND FAMILY DIVERSITY
Examination of the changing character of individual and family diversity, as related to the intersections among gender, race, class, sexuality, age, and ability. Junior standing required Pre: 2304. (3H,3C) I,II.

4374: PARENT EDUCATION AND PRACTICE
Students review concepts, principles, program trends, and research related to parent education using a life course approach. Students examine parenting diversity including parents of different social addresses and parents with chronically ill, mentally and physically challenged, or gifted children. Guided observation, implementation, and development of parent education programs. Senior standing required. Pre: 1004, 2004, 2304, 4324. (3H,3C)

4714: SENIOR CAPSTONE SEMINAR
Intensive learning experiences in critical thinking and analysis. Opportunities to demonstrate breadth of learning while developing leadership skills and honing professional competencies. Topics include leadership and team development, problem solving, grant writing, program evaluation, and electronic portfolios. Senior standing in Human Services required. (3H,3C)

4964: FIELD STUDY
Variable credit course. Pre: 1004, 2004, 2335, 2336.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Liberal Arts and Human Sciences

Department of Religion and Culture

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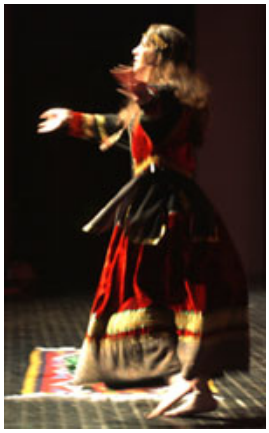

Peter Schmitthenner, Chair
Director of Undergraduate Studies (IDST): Peter Schmitthenner
Professors: B. Britt; E. Fine; E. Struthers Malbon; M. Saffle
Associate Professors: A. Abeysekara; A. Puckett; P. Schmitthenner
Assistant Professors: M. Gabriele; E. Satterwhite; B. Sax; R. Scott
Visiting Assistant Professor: P. Olson
Instructors: H. Dyer; G. Harrington Becker; J. Henderson; K. Precoda; B. J. Reeves; J. Roberts; S. Samanta; J. Watson
Academic Advisors: J. Marie; C. Slusser (231-6630)

Overview

Interdisciplinary Studies (IDST) is the undergraduate degree offered by the Department of Religion and Culture. The programs in this department provide an opportunity for students and faculty to explore and question traditional areas of knowledge through the application of interdisciplinary and multidisciplinary perspectives. The IDST curriculum fosters an understanding of United States and world cultures and religions in historical and contemporary contexts. IDST encourages students to consider the aesthetic, ethical, political, scientific, and technical dimensions of human experience and culture and to recognize the commonality and diversity of human experience, beliefs, and practices. IDST emphasizes global and environmental interdependence and social responsibility as part of its effort to prepare students for a lifetime of cultural, social, environmental, and technological change.

The Department of Religion and Culture offers both an interdisciplinary major (IDST), cross-program degree options, and a number of minors/concentrations that may be selected by students in any major. In this section of the catalog, the undergraduate major, IDST, is described first. This is followed by a list of degree options, minors/concentrations, and then a description of each of the programs in the department. Look under the specific program for a description of the requirements of the concentration(s)/minor(s) and a description of the courses offered by that program.

A graduate Certificate in Liberal Arts (LRTC) is also available. See the Graduate Catalog.

Interdisciplinary Studies Major (IDST)

Peter Schmitthenner, Director of Undergraduate Studies
Joan M. Watson, Assistant Director of Undergraduate Studies
Advising Coordinator: C. S. Slusser

The interdisciplinary studies (IDST) major is an undergraduate major leading to a Bachelor of Arts degree in Interdisciplinary Studies. IDST provides an opportunity for students to explore topics and issues through the application of interdisciplinary and cross-disciplinary perspectives. Most students who choose IDST as a major are more interested in developing complex problem solving skills, critical thinking, and acquiring a broad education, than in gaining specialized skills for a single occupation. The global focus of the major affords career opportunities in education, business, government, industry, and the service sector, including the nonprofit sector. First-year students entering IDST rate themselves as more skilled than other students in writing and express a greater interest in issues related to leadership and diversity. The major has a strong academic and career advising component.

Degree Requirements

With the exception of students in the IDST Cross-Program Degree Options in Africana Studies (IDAS), Education and Social Change (IDED), Religious Studies (IDRS), and Women's Studies (IDWS), the requirements of the IDST major are completed by (a) Curriculum for Liberal Education requirements; (b) the 18-hour IDST Core; (c) 6 hours of foreign language, contemporary non-U.S. culture and civilization, or approved study abroad; and (c) two approved minors or concentrations. All degree requirements are those in effect the year the degree is completed. A complete checksheet showing all degree requirements in detail is available on-line and through the IDST Advising Office. The 18-hour IDST Core consists of:

3 credits, IDST 1114
3 credits of an approved diversity course,
6 credits of 3000-4000-level courses in one of the programs in IDST
3 credits, IDST 3114: Interdisciplinary Topics, and
3 credits, IDST 4114: Senior Research Seminar

IDST Program Degree Options

To complete the IDST major, students must fulfill the requirements for the IDST Core, the culture and civilization requirement, and two minors.

TOP

IDST Cross-Program Degree Option in Africana Studies (IDAS)

IDST awards a degree option in Africana Studies (IDAS). This degree option is designed to assess critically present cultural and structural forces and the historical conditions that have given rise to the economic, legal, psychological, educational, social and moral status of Americans of African descent, as well as Africans on the continent and throughout the Diaspora. The Africana Studies curriculum privileges an interdisciplinary approach. The curriculum is composed of courses in literature, history, sociology, political science, religion, and gender relations.

Students in the IDST Cross-Program Degree Option in Africana Studies complete the 18-hour IDST Core, the foreign language or culture and civilization requirement, and 30 hours in Africana Studies.

IDST Cross-Program Degree Option In Education and Social Change (IDED)

The IDST Degree Option in Education and Social Change provides an undergraduate major focused on a curriculum that enhances socio-cultural awareness and emphasizes education and educators as agents of social change. The Education and Social Change degree option in IDST not only prepares students for graduate study in early childhood and elementary education, it also introduces students to new niches and possibilities for affecting change in local and global communities while respecting their cultural traditions and sensibilities.

A minimum of 120 non-duplicated semester credits is required for an IDST degree in Education and Social Change. Students will complete 36 hours in the Curriculum for Liberal Education; 12 hours in the IDST Core, including an introductory course in interdisciplinary theory and practice (IDST 1114), a topical course in interdisciplinary application (IDST 3114), a service learning internship (IDST 3004), and a senior capstone course (IDST 4114); 12 hours in Socio-Cultural Awareness Courses in IDST programs; 6 hours in Introductory Study in Humanities; 12 hours in Advanced Study in IDST Programs; 6 hours in Socio-Cultural Awareness Courses outside of IDST; 27 hours in Required Courses for PK-6 Endorsement; and 15-18 hours in PK-6 Content Area Concentration courses.

IDST Degree Option in Religous Studies (IDRS)

The IDST Degree Option in Religious Studies serves effectively as a major in Religious Studies. In addition to 18 semester hours in the IDST "Core," students complete at least 30 hours of Religious Studies and Judaic Studies courses. The IDST Core includes IDST 1114, an IDST Diversity Course, IDST 3114, 6 credits of 3000-4000 level courses from one of the IDST programs, and IDST 4114 (or an approved substitute). The 30 hours of REL and JUD courses include 6 credits of introductory REL courses, 9 credits from REL and JUD courses at the 2000-level and above, 9 credits from REL and JUD courses at the 3000- and 4000-level, and 6 credits from a list of courses outside the REL designator. While courses may not "double-count" within the 30-hour REL/JUD requirement, some courses may be approved to "double-count" for the IDST Core and REL/JUD course requirements.

IDST Degree Option in Women's Studies (IDWS)

The degree option in Women's Studies requires 30 hours of course work, at least 15 hours of which must be at the upper division (3000-4000) level. Four WS courses are required, including WS 1824, WS 2114, WS 2254 and WS 4224, which are ideally taken in sequence. Numerous approved electives within WS and related fields are offered. Students pursuing the degree option must complete at least six hours of course work explicitly focused on multiple forms of inequality. Students pursuing the degree option should see the Women's Studies Director in the Department of Sociology to enroll.

Study Abroad

IDST majors are required to complete 6 credit hours (the equivalent of two 3-credit classes) in either a foreign language or contemporary non-US culture and civilization. Students are strongly encouraged to complete an approved study abroad program outside of the U.S. to satisfy this requirement.

Honors Program

Eligible IDST students are encouraged to participate in the University Honors Program. Completing a degree "In Honors" is an excellent way for outstanding students to integrate the knowledge from several disciplines. Honors students have considerable flexibility in completing the degree requirements.

Double Majors

For information on earning a double major or second degree, contact the IDST Advising Office.

Satisfactory Progress Policy

Students enrolled in IDST must meet the following requirements by the end of the academic year in which the student has attempted 72 semester hours (including transfer, course withdrawals, AP, advanced standing, and credit by exam hours):

Completed at least 6 credits in IDST Core and have a minimum 2.0 GPA.
Earned a minimum of a 2.0 in-major GPA.

TOP

IDST Concentrations and Minors

The following concentrations or minors are offered by programs in IDST. Additional information about each can be found on our website at www.idst.vt.edu. The minors or concentrations may be used as one of the two minors or concentrations required to complete the IDST major. Students in any major may opt to declare them as minors.

American Indian Studiesb(also see the Department of Sociology)
American Studies
Appalachian Studies
Asian Area Studies
Film Studies
Humanities
Humanities and the Arts
Humanistic Traditions
Judaic Studies
Medieval and Early Modern Studies
Popular Culture
Religious Studies
Women's Studies (also see the Department of Sociology)

Appalachian Studies Program

Anita Puckett, Director
Professors: E. Fine; R. Goss (AHRM)
Associate Professors: S. Cook (SOC); A. Puckett
Assistant Professors: E. Satterwhite
Visiting Assistant Professors: K. Precoda
Instructors: S. Jackson; E. Chancey

Adjunct Faculty: J. Mann (ENGL); S. Mooney (ENGL); B. Smith (SOC)

The Appalachian Studies Program is an academic program supporting teaching, research, and service on issues pertaining to Appalachia. The Appalachian Studies minor provides students with the opportunity to study complex social, political, economic, and environmental issues important to the region from a number of disciplinary perspectives. Appalachian Studies faculty focus on these issues from a critical regionalism perspective in which the relationship between these issues and region is considered problematic and open to investigation.

The Appalachian Studies minor focuses on complex cultural, political, economic, and environmental issues in the study of an important American region. The course of study ranges from mythic to modern Appalachian America and also provides opportunity for cross-cultural study of mountain cultures worldwide. A checksheet for this minor is available on-line or through the IDST advising office.

Humanities Program

Elizabeth Fine, Director
Professors: E. Fine, M. Saffle
Associate Professors: A. Abeysekara; A. Puckett; P. Schmitthenner
Assistant Professors: M. Gabriele; E. Satterwhite
Visiting Assistant Professors: P. Olson
Instructors: H. Dyer; G. Harrington; K. Precoda; B. Reeves; C. Roberts; S. Samanta; J. Watson
Adjunct Faculty: S. Cook (SOC); N. King (SOC); T. Papillon (Foreign Languages)

The Humanities Program offers interdisciplinary courses, many of which are in Area 2 of the Curriculum for Liberal Education, and interdisciplinary concentrations and minors open to all university students. Courses lead to the understanding of cultural legacy from ancient through modern civilizations, explored through the traditional humanities disciplines: philosophy, history, and the arts, including languages, literatures, fine arts, architecture, music, and theatre arts.

Humanities Minors and Concentrations

All 18-hour humanities minors and the 15-hour Humanistic Traditions Concentration may be used to complement any disciplinary major in the university or as one part of an IDST degree. For more information, and lists of options for minors and concentrations, contact the minor or concentration coordinator or the IDST advising center.

TOP

American Studies Minor

American studies is an interdisciplinary field that draws upon a number of academic disciplines, including history, literature, sociology, to consider relationships between culture and society in the United States as it is embedded in global processes and issues. Students work closely with an advisor to plan a coherent program tailored to each student’s interest.

To complete a minor in American studies at Virginia Tech, students take HUM 2504: Introduction to American Studies and IDST 3114.

Students then choose twelve hours of course work from at least two of four areas: literature; history; the arts and communications; and cultural studies. The approved list includes a variety of courses with a North American emphasis from literature, history, art history, architecture, Africana studies, communications, humanities, music, political science, religious studies, women’s studies, landscape architecture, and urban affairs. Appropriate special topics courses and honors colloquia may be substituted. A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Emily Satterwhite

Asian Area Studies Minor

The interdisciplinary minor in Asian Area Studies focuses on the great cultural traditions of the Middle East, South Asia (including India), East Asia (China, Japan, Korea), Southeast Asia, and Central Asia. The majority of the earth's peoples belong to one of these cultures, influential for many centuries and representing some of the world's most unique, sophisticated, and important visions of the human experience. Students explore how various Asian traditions explain and represent this experience in literature, philosophy, religion, history, the social sciences, and the arts.

Students work closely with an advisor to shape a program that reflects the student's interest within the range of offerings available for the program. A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Peter Schmitthenner

TOP

Film Studies Minor

French director Jean-Luc Godard famously proclaimed that cinema is truth 24 times a second.

Cinema is a key medium of modern mass communication, information-dissemination, and entertainment. It is at once a business, an industry, a means of creative expression, and a social and political force. It has played a vital role in modern political and social movements, and the power of its aesthetic designs and emotional appeals have helped to shape many coordinates of modern thought and culture.

Familiarity with its history, its aesthetic designs, and its industrial context enables students to develop skills that are fundamental to negotiating life in modern society where they are surrounded by images and by the appeals made by image-based media. The Minor in Film Studies addresses cinema in its multiple contexts. Students learn about the history of cinema, its aesthetic designs and production methods, its role in modern social and political movements, and its business operations.

Coordinator: Stephen Prince (COMM)

TOP

Humanities and The Arts Minor

The minor in Humanities and the Arts was developed by the Humanities Program in cooperation with faculty from the departments of Art and Art History, Communication Studies, English, Music, Theatre Arts, and the College of Architecture and Urban Studies. It aims to acquaint students with the historical, critical, and practical dimensions of the arts, while simultaneously examining the relation of the arts to other human endeavors (cultural, philosophical, political, religious, scientific, and social). A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Michael Saffle

Humanities Minor

The Humanities minor gives students the opportunity to create a focused package of Humanities coursework within the following broad guidelines:

A. 18 hours (6 courses) of courses designated HUM are required.
B. At least 9 hours (3 courses) must be at the 3000-4000 level; HUM 4974: Independent Study is strongly suggested as a means of integrating coursework in the minor.
C. Suggested tracks are Historical, Modern and Cross-cultural, but students may design their own combinations of courses with an advisor, who will make substitutions to the courses within the tracks, as appropriate.

A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Elizabeth Fine

TOP

Humanistic Traditions Concentration

The course of study for the Humanistic Traditions Concentration requires at least 15 hours (five courses) in Humanities (HUM). This concentration offers a sustained and broad investigation of the human cultural experience over different time periods and cultures. A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Elizabeth Fine

Medieval and Early Modern Studies Minor

The Medieval and Early Modern Studies Minor was developed by the Humanities Program in conjunction with faculty from participating departments. The minor allows students to gain a broad interdisciplinary understanding and appreciation of events and ideas between the fourth and seventeenth centuries, although it encourages some degree of specialization. Students work in close association with an advisor who will help plan a coherent program tailored to the student's interests, but which also reflects the range and variety of Medieval and Early Modern Studies. A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Matthew Gabriele

Popular Culture Minor

The minor in Popular Culture provides an understanding of the broadly shared cultures made possible by mass production. Popular culture includes all widely practiced and distributed expressions: news; entertainment; religion; sports; popular art; and styles of decoration, dress, and architecture. Familiarity with the forces that shape its production and reception allows students to develop skills fundamental to life in a consumer-capitalist economy and citizenship in an information age. Minors examine the uses of mass culture by politicians, entertainment companies, consumer-marketers, religious authorities, educators, designers, engineers, and various groups of consumers themselves.
A checksheet for this minor is available on-line or through the IDST advising office.

Coordinator: Neal King (Sociology)

TOP

Undergraduate Course Descriptions (IDST)

1114: INTRODUCTION TO INTERDISCIPLINARY STUDIES
Introduces the concept of interdisciplinarity. Explores the ways of knowing particular to disciplinary and interdisciplinary fields of inquiry. Emphasizes the integration and application of disciplinary and interdisciplinary approaches to examine and resolve an issue or group of issues. (3H,3C)

1814 (AFST 1814): INTRO AFRICAN STUDIES
Introduces students to the study of sub-Saharan Africa-- history, politics, economics, arts, and cultures--and to Africa's place in the world. Required first course in the African (Area) Studies concentration. (3H,3C) I,II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: IDST INTERNSHIP

Placement in a work setting, on or off campus, for an internship that will serve as a practical experience for eligible students. May be repeated for elective credit up to a maximum of 12 credit hours (1 academic credit earned for every 45 hours worked per 15 week semester); cannot be used for core or minor requirements. Junior or Senior standing and instructor consent required. Variable credit course. X-grade allowed. I,II,III,IV.

3114: TOPICS IN INTERDISCIPLINARY STUDIES
Variable content, variable credit course that addresses a complex issue or problem through more than one discipline or intellectual domain. Places at the foreground the discussion of how several different methodological approaches inform our understanding of an issue or group of related issues. Often taught by teams of instructors in distinct, instructional modules or learning experiences. Three credit version is writing intensive. May be repeated with different content for a maximum of 6 credits. Variable credit course. Pre: 1114.
I,II,III.

3114H: HONORS TOPICS IN INTERDISCIPLINARY STUDIES
Variable content course that addresses a complex issue through more than one discipline or intellectual domain. Places at the foreground the discussion of how several different methodological approaches inform our understanding of an issue or group of related issues. May be repeated with different content for a maximum of nine credit hours. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

3984: SPECIAL STUDY
Variable credit course.

4114: SENIOR RESEARCH SEMINAR
Senior seminar designed to integrate assumptions, theories, and methods of more than one disciplinary perspective. Includes exploration of interdisciplinary research methods, such as case study and ethnography. Includes developing a proposal for an interdisciplinary senior project. Senior standing required. Pre: 3114 or 3114H. (3H,3C)

4224: SENIOR PROJECT
This seminar is designed to assist students to complete an interdisciplinary senior project. The project may be a thesis, undergraduate research, action-oriented project, or expressive project in the humanities or the arts such as a video, performance, or a photography or visual art exhibit. Pre: Senior standing and IDST 4114 or completion of a preliminary proposal through an approved independent study. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Undergraduate Course Descriptions (HUM)

Introductory Courses: *Introductory culture courses focus on the culture of a particular age and place through critical examinations of a wide range of human activities: the arts, philosophy, history, politics, religion, economics, science, and technology. Emphasis is placed on the interrelationships among these endeavors and their contributions toward shaping the values and aspirations of their, and our, age and culture. Humanities and the Arts courses explore relationships between the arts and other human endeavors. Classes emphasize writing and classroom discussion of issues raised in readings, lectures, and multi-media presentations, including music, drama, film, and slides of art and architecture.*

1104 (AINS 1104): INTRODUCTION TO AMERICAN INDIAN STUDIES
Introduces students to the richness and complexity of American Indian societies past and present. The course begins by considering the critical question of what it means to be "American Indian" or "Native American," comparing externally produced stereotypes with a wide variety of indigenous discourses and narratives. Through a special focus on specific indigenous groups and regions, the course examines American Indian experiences with and reactions to colonial confrontations, government policies, and cultural interchanges with non-Indians.
(3H,3C)

1114: INTRODUCTORY HUMANITIES: THE CLASSICAL AGE
The world of classical Athens through its embodiments in the arts, philosophy, politics, history, literature, and religion. Emphasis on the interrelationships among the various forms of cultural expression and their contributions toward shaping the values and aspirations of the age.
(3H,3C)

1124: INTRODUCTORY HUMANITIES: THE ROMAN WORLD AND EARLY CHRISTIANITY
The Roman world and early Christian culture. Emphasis on the interrelationships among the arts, literature, philosophy, history, religion, and their contributions toward shaping the values and aspirations of the age. (3H,3C)

1214: INTRODUCTORY HUMANITIES: THE MEDIEVAL WORLD
The medieval synthesis in Western European thought and the transition to the world of the Renaissance. Emphasis on the interrelationships among the arts, literature, philosophy, history, religion, and science, and their contributions toward shaping the values and aspirations of the age. (3H,3C)

1224: INTRODUCTORY HUMANITIES: THE RENAISSANCE
The interrelationships among the arts, literature, philosophy, history, religion, and science of the Renaissance in Western Europe, and how they reflect and contribute to the shaping of the values and aspirations of the age. (3H,3C)

1314: INTRODUCTORY HUMANITIES: ENLIGHTENMENT AND ROMANTICISM
Major notions and cultural expressions of the Enlightenment and of Romanticism. Emphasis on the interrelationships among the arts, literature, philosophy, history, religion, and science. (3H,3C)

1324: INTRODUCTORY HUMANITIES: THE MODERN WORLD
The shifts in thought and values over the past century in the Western imagination. Emphasis on the interrelationships among the arts, literature, philosophy, history, religion, and science, and their contributions toward shaping the values and aspirations of the age. (3H,3C)

1604: INTRODUCTION TO HUMANITIES AND THE ARTS
Explores the verbal, visual, and aural arts of several important periods in Western history, setting them in the context of their times. Introduces the structural principles of each art form. (3H,3C)

1704: INTRODUCTION TO APPALACHIAN STUDIES
Traces the idea of Appalachia in American and world consciousness and its expression in the humanities and arts. Through comparison with other cultural groups, explores humanistic problems of cultural identity, assumptions, change, and manipulation. (3H,3C)

1914: EXPLORATIONS IN TRADITIONAL ASIAN CULTURES
An introduction to salient cultural characteristics of the major premodern Asian civilizations of the Middle East, India, China, Japan, Southeast Asia, and Central Asia. Differing visions of the human condition represented by these traditions are compared in case studies incorporating historical, literary, philosophical, and artistic works. (3H,3C)

1924: EXPLORATIONS IN MODERN ASIAN CULTURES
An introduction to the cultural modernization of major Asian societies since the eighteenth century. The cultural transformation of the Middle East, South Asia, China, Japan, and Southeast Asia are exemplified and compared in case studies that incorporate modern Asian historical, literary, philosophical, sociopolitical, and artistic works. (3H,3C)

2004: RESEARCH STRATEGIES AND LIBRARY RESOURCES

Focuses on familiarity with specific research tools and construction of logical, efficient methods to research a major paper. Open to all students and tailored to their majors. Concept of library as a learning laboratory. (3H,3C)

2104 (AINS 2104) (COMM 2104): ORAL TRADITIONS AND CULTURE
Examination of the world's great oral traditions, both ancient and contemporary. Emphasis on performance contexts, relationships among multicultural traditions, including American Indian oral traditions, and the relationships among orality, literacy, technology, media, and culture. I (3H,3C)

2204: HUMANITIES AND THE ARTS: THE CREATIVE PROCESS
Explores the theory and the experience of the creative process. Studies both essays on the process of creative activity and examples of its product. Includes a personal creative project. (3H,3C)

2214: EXPERIENCES IN THE ARTS
Guided exposure to selected works of art, including painting and sculpture, literature, and the performing arts as well as participation in arts events; exploration of ways in which individual works of art embody and help explain human experience. May not be repeated for credit. Pass/Fail only. (1H,1C)

2444 (CLA 2444) (ENGL 2444): ANCIENT GREEK AND ROMAN MYTHOLOGY
Survey of Ancient Greek and Roman mythology and modern interpretations. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (3H,3C)

2454 (CLA 2454) (ENGL 2454): ANCIENT GREEK AND LATIN LITERATURE IN ENGLISH TRANSLATION
A variable content course devoted to the study of major works of Ancient Greek and Latin literature in English translation. May be repeated for credit with different content. In English. No knowledge of Ancient Greek or Latin required. Not for credit toward a Latin Minor. (4H,3C)

2504: INTRODUCTION TO AMERICAN STUDIES
Methodology and tools of American Studies, emphasizing interrelations among social, cultural, and technological history, values, and artistic creation. Intensive study of a specific topic or period in American culture since 1850. (3H,3C)

2514: ASIAN AMERICAN EXPERIENCE
Critical overview of diverse Asian-American experience, the complexity of minority status, and meaningful citizenship in the USA. Topics include different historical tracks of various Asian ethnicities, experience of racism, activism, cultural adaption and conflict, and economic survival and success. (3H,3C)

2714 (FR 2714): INTRODUCTION TO FRENCH CULTURE AND CIVILIZATION
French culture and civilization from the Middle Ages to the present. Interdisciplinary approach to literature, film, art, architecture, and theatre in the context of French cultural history. In English. (4H,3C)

2724 (GER 2724): INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION
German culture and civilization from the earliest period to the present. Interdisciplinary approach to literature, film, art, architecture, music, and theatre in the context of German cultural history. In English. (3H,3C)

2734 (RUS 2734): INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
Russian culture and civilization from the Middle Ages to the present. Interdisciplinary approach to Russian literature, art, architecture, music, film, and theatre in the context of Russian cultural history. In English.
(4H,3C)

2744 (SPAN 2744): INTRODUCTION TO SPANISH CULTURE AND CIVILIZATION
Introduction to Spanish culture and civilization from the Middle Ages to the present. Interdisciplinary approach combining the study of literature, the arts, architecture, music, theatre, and film in the context of Spanish cultural history. In English. (4H,3C)

2754 (SPAN 2754): INTRODUCTION TO SPANISH-AMERICAN CULTURE AND CIVILIZATION
Spanish-American culture and civilization from the discovery of the New World to the present. Interdisciplinary approach to literature, film, art, architecture, music, and theatre in the context of Spanish-American cultural history. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014: HUMANITIES AND THE ARTS: RENAISSANCE AND EARLIER
Focuses on interdisciplinary topics involving interrelationships among various arts and/or artists (to the end of the Renaissance). (3H,3C)

3024: HUMANITIES AND THE ARTS: POST RENAISSANCE
Focuses on interdisciplinary topics involving interrelationships among various arts and/or artists (from the end of the Renaissance). (3H,3C)

3034 (COMM 3034): THEORIES OF POP CULTURE
Relationship of popular culture to communication; ways to classify, analyze, and evaluate popular culture; history of main themes with emphasis on

the United States; cultural evolution of the electronic revolution. Junior standing required. I (3H,3C)

3204 (COMM 3204): MULTICULTURAL COMMUNICATION
Exploration of communication in various cultural groups through the medium of performance. Emphasis on understanding cultural differences and similarities in styles of communication, aesthetics, worldviews, and values. (3H,3C)

3464 (AHRM 3464) (EDHL 3464) (GEOG 3464) (HD 3464) (SOC 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. Must have completed one 2000-level course in any cross-listing department. (2H,3L,3C)

3684 (HIST 3684): CULTURAL HISTORY OF THE SOVIET UNION AND THE SUCCESSOR STATES
History and main characteristics of cultural life and the arts in the former Soviet Union, with emphasis on film, music, literature, and the relationship between elite and popular culture. Taught alternate years. (3H,3C) II.

3954: STUDY ABROAD
Variable credit course.

4004 (AINS 4004): TOPICS IN AMERICAN INDIAN STUDIES
A variable topics course in which students will engage an interdisciplinary methodology to pursue a critical and in-depth examination of various topics concerning and pertinent to American indigenous peoples. This course is repeatable for up to 6 hours credit with different topics. Must meet prerequisite or have permission of the instructor. Pre: AINS 1104. (3H,3C)

4034 (COMM 4034): FUNCTIONS OF POPULAR CULTURE
Popular culture as a humanistic discipline; emphasis on archetypes, formulas, and genres; the function of ideas, images, and icons on the popular imagination. Senior standing required. (3H,3C)

4044: TOPICS IN HUMANITIES AND FILM
This course introduces students to critical issues in film from a humanistic but interdisciplinary perspective, examining its production, consumption, and effects on various societies. The specific thematic content is variable. Course may be repeated for up to 9 credits. Pre: 2504, 3034 or COMM 2054. (3H,3C)

4104: EXPLORATIONS IN ADVANCED HUMANITIES TOPICS
In-depth study of special interdisciplinary topics. Topics vary but involve a close and extensive study of the interrelationship between important cultural ideas and movements, and formative myths and values, and their expression in several of the following forms: literature, philosophy, religion, art, music, drama. May be taken only once for credit. (3H,3C)

4324 (REL 4324): TOPICS IN RELIGION AND CULTURE
Selected topics from the religions of the world such as time and the sacred, preliterate religions, women and religion, religion and science, mysticism. May be taken three times for credit with different topics. Pre: 3 REL credits. (3H,3C)

4404: APPALACHIAN FOLK CULTURE
Examination of informal learning systems and traditional aesthetic expressions in Appalachia. Investigation of worldview and cultural premises as expressed in traditional artifacts. (3H,3C)

4414: CRITICAL ISSUES IN APPALACHIAN STUDIES
Examination of dominant value conflicts in contemporary Appalachia, focusing on questions of exploitation of human and natural resources. Comparative study of Appalachia, other mountain cultures worldwide, and the Third World. Pre: 1704.
(3H,3C)

4554: SCIENCE CAPSTONE SEMINAR
Seminar for advanced undergraduates majoring in the natural sciences. Students and faculty representing several natural science disciplines (including biochemistry, biology, chemistry, geology, physics) participate in the preparation, presentation, and discussion of topics representing a wide range of interdisciplinary scientific interests. Invitation of student's major department required. Pass/Fail only. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC| Communication
English | Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies
International Studies | Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Department of Religion and Culture

Judaic Studies Program

Professors: B. Britt; E. Stuthers Malbon
Associate Professors: C. Kiebuzinska (English); S. Knapp (English); E. Sheinberg (Music)
Assistant Professors: E. Meitner (English); B. Sax; R. Scott

Endowed in 1996, the Malcolm and Diane Rosenberg Program in Judaic Studies offers students the opportunity to explore, examine, and critically engage the rich and multifaceted history, religion, and culture of the Jewish people. As members of a community that has crossed a number of borders and cultures, the Jews have served as transmitters of texts and ideas, as agents of cultural and intellectual cross-fertilization and innovation. Judaic culture has significantly contributed to Western and other civilizations.

The program is multidisciplinary in nature, and complements various existing courses and programs dedicated to major religions and cultures at Virginia Tech. The minor in Judaic Studies (IDJS) fits especially well as part of the Interdisciplinary Studies (IDST) major.

The minor is an option for students in all majors. The student who chooses a minor in Judaic Studies will work closely with a faculty advisor to tailor an academic program which fits the interests of the student while also ensuring the student's acquaintance with the diverse topics of Judaic Studies. The minor requires 18 credit hours, which may be used towards the IDST major with other minors at Virginia Tech. Students will take the two required courses and then choose four additional courses from three units, at least one course from each unit.

Required courses (6 hours):
JUD 2134: Judaism: A Survey of History, Culture and Heritage
JUD/REL 2414: Hebrew Bible/Old Testament

Elective courses (12 hours, at least one course from each unit):
Unit 1: Hebrew Language
JUD/HEB 1104: Hebrew Language
JUD/HEB 1114: Accelerated Elementary Hebrew Language

Unit 2: The Jewish Experience
JUD/HIST 3494: The Holocaust
JUD 3424: Topics in Jewish Culture, History and Thought
REL 4414: Topics in Biblical Studies
JUD 4424: Adv. Topics in Jewish Culture, History and Thought

Unit 3: Israel Studies
HIST 2346: History of the Middle East
HIST 3654: The Arab-Israeli Dispute
JUD/PSCI 3544: The State of Israel: A Political History
JUD 4974: Independent Study

Judaic Studies Courses (JUD)

1104 (HEB 1104): INTRODUCTION TO HEBREW LANGUAGE, CIVILIZATION AND CULTURE
Fundamentals of Modern Hebrew language with emphasis on grammar, reading, composition, and conversation. For students with no prior knowledge of the language. (3H,3C)

1114 (HEB 1114): ACCELERATED ELEMENTARY HEBREW LANGUAGE
Complementary introduction to the fundamentals of Modern Hebrew language with continued emphasis on grammar, reading, composition, and conversation. This course is for students who have completed 1104 or with permission from instructor. 1114 is a four-credit course with a self-instruction component that demands student time outside of class. Pre: 1104. (3H,2L,4C)

2134: JUDAISM: A SURVEY OF HISTORY, CULTURE AND HERITAGE
A thematic and historical introduction to ancient, medieval, and modern Judaism, up to the founding of the State of Israel. Themes will include monotheism, exile, mysticism, Kabbala, Hasidism, anti-Semitism, the Holocaust, and Judaism in Israel and America. I (3H,3C)

2414 (REL 2414): HEBREW BIBLE/OLD TESTAMENT
Introduction to the academic study of the Hebrew Bible (Old Testament); a variety of scholarly approaches to the Bible, including historical-critical, literary, and gender studies. Emphasis on developing skills in critical thinking, reading, and writing about the Bible. Previously taught as 2405. I (3H,3C)

2984: SPECIAL STUDY
Variable credit course.

3424: TOPICS IN JEWISH CULTURE, HISTORY & THOUGHT
Selected topics in Jewish culture, history and thought. The courses will focus on a variety of specific issues and will tend to be held as an in-depth seminar in affiliation with the Honor Student's Program. Possible topics include: Jewish thought and philosophy in one of the three periods- ancient, medieval or modern; the American Jewish experience; Jewish music and art (Judaica); Jewish mysticism, and various cultural movements and religious traditions. Taught alternate years. I (3H,3C)

3494 (HIST 3494): THE HOLOCAUST
This course provides a historical account, a psychological analysis and an occasion for philosophical contemplation on the Holocaust. We will examine the deliberate and systematic attempt to annihilate the Jewish people by the National Socialist German State during World War II. Although Jews were the primary victims, Gypsies, the handicapped, homosexuals, Jehovah's Witnesses and political dissidents were targeted, we will discuss their faith as well. The class will be organized around the examination of primary sources: written accounts, photographic and film, personal testimony. Taught alternate years. (3H,3C)

3544 (PSCI 3544): THE STATE OF ISRAEL: A POLITICAL HISTORY
This course provides a survey on the political history of the State of Israel and highlights major themes uniquely characterizing the specific events surrounding its establishment and its first 50 years of existence. Additionally, the course will add a comparative dimension by using the political history of Israel as a case study to discuss major themes in political science such as democracy, government, political economy, etc. Taught PSCI 1024 or JUD 2134. alternate years. Pre: or 2134). (3H,3C) II.

4424: ADVANCED TOPICS IN JEWISH CULTURE, HISTORY & THOUGHT
Selected topics in Jewish culture, history and thought. The courses will focus on a variety of more advanced and more specific issues than those offered in JUD 3424. These courses will be held as an an-depth seminar in affiliation with the Honor Student's Program. Possible topics includes: the Philosophy of Maimonides, Spinoza or Buber, or a course dedicated to one of the following topics Kabbalah, Hasidism, The American Jewish experience in the first half of the 20th century, and Oriental Jewish art and folklore. Two JUD courses or senior standing required. Alternate years. (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

TOP

College of Liberal Arts and Human Sciences

Department of Religion and Culture

Religious Studies Program

Ananda Abeysekara, Director
Professor: B. Britt, E. Struthers Malbon
Associate Professors: A. Abeysekara; B. Britt
Assistant Professors: B. Sax; R. Scott
Visiting Assistant Professor: Z. Ni
Instructors: H. Dyer; S. Samanta

Religion is a topic as broad as the study of people, their histories, literatures, arts, and ways of thinking. To study religion is to explore the many ways people in various cultures and times have expressed their deepest convictions about life and death, the universe, law, politics, and identity.

Studies in religion offer an examination of the values and sacred traditions that have been cherished and contested throughout history. Courses in religious studies use a variety of approaches. Some are descriptive in character, dealing with historical or contemporary forms of religious phenomena and thought. Others employ literary methods in the study of sacred texts or engage the student in reflection about contemporary religious and secular thought and issues. Still others pose normative questions about certain issues or controversies concerning religious traditions themselves (e.g., Why do many religions that are practiced in America differ from their counterparts elsewhere? Is homosexuality compatible with Christianity? Does feminism in Islam coincide with its founding?) By examining a diversity of traditions and viewpoints, a program in religious studies provides the resources for an intellectually responsible appraisal of one's own value commitments. Students choose religious studies as a part of a broad liberal arts education, and some who have minored in religious studies have gone on to pursue graduate study in a variety of fields (including the academic study of religion) or to professional training in ministerial or social service vocations.

The IDST Degree Option in Religious Studies serves effectively as a major in Religious Studies. In addition to 18 semester hours in the IDST "Core," students complete at least 30 hours of Religious Studies and Judaic Studies courses. The IDST Core includes IDST 1114, an IDST Diversity Course, IDST 3114, 6 credits of 3000-4000 level courses from one of the IDST programs, and IDST 4114 (or an approved substitute). The 30 hours of REL and JUD courses include 6 credits of introductory REL courses, 9 credits from REL and JUD courses at the 2000-level and above, 9 credits from REL and JUD courses at the 3000- and 4000-level, and 6 credits from a list of courses outside the REL designator. While courses may not "double-count" within the 30-hour REL/JUD requirement, some courses may be approved to "double-count" for the IDST Core and REL/JUD course requirements.

The Religious Studies minor may be completed by any student whose major requires or permits a minor. The Religious Studies minor may also be chosen as one of two individually-selected minors (or concentrations) as part of the Interdisciplinary Studies (IDST) degree. For the Religious Studies minor, a student must complete a total of 18 semester hours (usually 6 courses) in Religion, including 6 hours at the 1000 level, 6 hours at the 2000-4000 level, and 6 hours at the 3000-4000 level. In the process of meeting these requirements, the student must also satisfy a diversity requirement by successfully completing one of the following REL courses: 1014, 2144, 2234, 2734, 2744, 3214, 3224, 3234, or 4074 or 4324 with an appropriate and approved topic.

Many religious studies courses fulfill requirements for the Curriculum for Liberal Education. The following courses are approved for Area 2 (Ideas, Cultural Traditions, and Values): REL 1014, 1024, 1034, 1044, 2124, 2234, 2414, 2424, 3024, 3214, 3224, 3414, 3424. REL 1024, 2234 and 2464 are also approved for Area 7 (Critical Issues in a Global Context).

Religous Studies Courses (REL)

1014: ASIAN RELIGIONS
The nature of "religion," approaches to understanding "religion," traditional and contemporary features of Asian "religions" (including Hinduism, Buddhism, Confucianism, Taoism, Shinto), including their manifestations in the USA and their involvement in critical issues in a global context. Previously taught as 1015. I (3H,3C)

1024: JUDAISM, CHRISTIANITY, ISLAM
The nature of "religion," approaches to understanding "religion," traditional and contemporary features of Judaism, Christianity, and Islam, including their manifestations in the USA and their involvement in critical issues in a global context. Previously taught as 1016. (3H,3C) II.

1024H: HONORS JUDAISM, CHRISTIANITY, ISLAM
(3H,3C)

1034: RELIGION AND THE MODERN WORLD
Modern challenges to traditional religion and responses to these challenges, including conservative, liberal, and radical responses; science and religion; issues of race and gender; church and state issues. Previously taught as 1025. (3H,3C) I,II.

1034H: HONORS RELIGION AND THE MODERN WORLD

(3H,3C)

1044: RELIGIOUS ETHICS
Influential representative social and religious ethical perspectives from the mid-sixties to the present; ethical reasoning on current pressing and perennial social issues based on historical and ethical analysis of case studies; theoretical assumptions about morality as the relation between justice and the good. Previously taught as 1026. (3H,3C) I,II.

2104 (GR 2104): GREEK NEW TESTAMENT
Readings from the New Testament in Greek, with attention to grammatical analysis, historical background and other clues to interpretation. Taught even years. May be repeated with different content for a maximum of 9 credits. Pre: GR 1106. (3H,3C)

2124: RELIGION IN AMERICAN LIFE
The role of religion in American life in selected periods from the original settlements to the present; the influence of religious institutions and movements in American history and the impact of the "American experience" on religious life and expression. Alternate years. Pre: 1034. (3H,3C)

2144 (AFST 2144): AFRICAN RELIGIONS
The role of religious (or belief) systems in African societies, especially the three predominant religious traditions in Africa: the so-called African Traditional Religions, Islam, and Christianity; the universe of religious systems and religious experiences and processes of Africa, in particular, Sub-Saharan Africa; critical examination of the mythic stature of Africa's "religions" within Western cultural (and scholarly) world views and institutions. (3H,3C)

2234 (WS 2234): WOMEN, ETHICS, AND RELIGION
Women's religious ethical formation; the roles and understanding of women in traditional and major modern religious traditions; authoritative writings and practices of various traditions as they focus on issues of sex and gender; gynocentric methods of study of women, ethics, and religion; feminist and womanist approaches to liberation and social change. (3H,3C)

2414 (JUD 2414): HEBREW BIBLE/OLD TESTAMENT
Introduction to the academic study of the Hebrew Bible (Old Testament); a variety of scholarly approaches to the Bible, including historical-critical, literary, and gender studies methods. Emphasis on developing skills in critical thinking, reading, and writing about the Bible. Previously taught as 2405. I (3H,3C)

2424: NEW TESTAMENT
Introduction to the academic study of the New Testament; a variety of scholarly approaches to the New Testament, including historical-critical, redaction critical, and literary methods. Emphasis on developing skills in critical thinking, reading, and writing about the New Testament as a way of understanding the faith and history of early Christianity. Previously taught as 2406. (3H,3C) II.

2464 (AAEC 2464) (STS 2464): RELIGION AND SCIENCE
Exploration of the relationships between religion and science in the western tradition. Topics include: basic frameworks for relationships between religion and science in historical and cultural context; types of human knowledge and truth; similarities and differences between science and religion; evolution; ecology; and contemporary issues. (3H,3C)

2734 (AFST 2734) (WS 2734): THE BLACK WOMAN IN THE U.S.
The emerging womanist perspective of "interstructured oppression" (i.e., the simultaneous effects of racism, sexism, and classism) as relevant to the contributions of Black women in the United States of America; views of Black women from African backgrounds, the Atlantic slave trade, and the progressive rise of womanist/feminist liberation movements in Black culture; contributions of Black women in the U.S. and globally. (3H,3C)

2744 (AFST 2744): THE BLACK CHURCH IN AMERICA
Interdisciplinary approach to African American religious experiences, utilizing traditional theological disciplines to analyze the ethos, pathos, logos, and theos that members of the African American faith communities pass down from generation to generation; the cultural, philosophical, and spiritual values of African American peoples viewed through the lens of Black non-fiction and fiction narratives; impact of the contexts of slavery and racism on Black life and religious expression. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3024: RELIGION AND LITERATURE
Analysis of literary works and critical debates in such areas as: pilgrimage, myth, disaster, and transcendence. Students will make presentations, develop their own research projects, and design sessions--with short reading assignments--later in the semester. As a final project, students will assemble a portfolio charting their work in the course. Alternate years. (3H,3C) II.

3214: RELIGION AND CULTURE IN INDIA
Interaction of religion and culture from Indus Valley civilization to the present; Brahmanism and Hinduism, the Buddha and his teachings, Parsis, Jains, Sikhs, and their respective literatures and rituals; modern reforms and recent trends. Alternate years. I (3H,3C)

3224: RELIGIONS OF CHINA AND JAPAN
Religious movements in East Asia with reference to specific situations in China and Japan; Confucianism, Taoism, Mahayana Buddhism, Vajrayana,

Shinto, Japanese Folk Religions, the "New Religions" of Japan; recent trends. Alternate years. (3H,3C)

3234: ISLAM
The rise of Islam under the Prophet Muhammad in Arabia and its spread across Asia and Africa. The development of Islam in the Middle Ages and its resurgence in the 20th century. Alternate years. Pre: 1024. (3H,3C)

3414: JESUS AND THE GOSPELS
Academic study of the four canonical gospels; Matthew, Mark, Luke, John; several scholarly methodologies; the problem of the historical Jesus; noncanonical gospels. Alternate years. I Pre: 2414, (2424). (3H,3C)

3424: PAUL AND HIS INTERPRETERS
Academic study of the New Testament letters by or attributed to Paul; historical, literary, and theological context of the letters; classic and contemporary interpreters. Alternate years. Pre: 2414 or 2424. (3H,3C)

4074 (HIST 4074): TOPICS IN RELIGIOUS AND INTELLECTUAL HISTORY
Selected topics in the role of religion and intellectual systems in human history. May be repeated with different content. 3 other hours of history required. Junior standing or above required. (3H,3C)

4324 (HUM 4324): TOPICS IN RELIGION AND CULTURE
Selected topics from the religions of the world such as time and the sacred, preliterate religions, women and religion, religion and science, mysticism. May be taken three times for credit with different topics. Pre: 3 REL credits. (3H,3C)

4414: TOPICS IN BIBLICAL STUDIES
Selected topics concerning either the Hebrew Bible (Old Testament) or the New Testament or both; a specific subject, theme, or biblical book chosen for careful, detailed analysis. Alternate years. Pre: 2424 or 3414. (3H,3C)

4414H: HONORS TOPICS IN BIBLICAL STUDIES
Selected topics concerning either the Hebrew Bible (Old Testament) or the New Testament or both; a specific subject, theme, or biblical book chosen for careful, detailed analysis. Alternate years. Pre: 2414 or 2424 or 3414 or 3424.
(3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences

International Studies

www.psci.vt.edu/internationalstudies/

Ioannis Stivachtis, Director

Overview

The international studies program offers an opportunity to learn about foreign cultures, languages, politics, economics, and history. The curriculum is interdisciplinary in orientation and is designed to introduce students to a variety of important approaches for understanding the international scene. Whether or not students will pursue careers directly related to world affairs, the understanding gained in the program will provide a much broader perspective of the world and the United States's place in it.

All students who wish to obtain a major in international studies must complete the Core Curriculum requirements of the College of Liberal Arts and Human Sciences. The program makes use of additional courses in international studies, economics, foreign languages, history, political science, and other disciplines.

The major in international studies requires successful completion of 48 semester hours of course work, including the following seven required courses (21 hours):

IS 2054: Intro. to World Politics
IS 2064: Global Economy and World Politics
ECON 2005, ECON 2006: Principles of Economics
PSCI 3615, PSCI 3616: International Relations
IS 4004: Seminar in International Studies
And the following:
12 hours of a single foreign language at the 3000-4000 level
15 hours of selected courses in one of these options:
(1) World Politics and Policy; (2) Global Development; (3) Business; (4) Environmental Affairs.

Internal Transfers

Transfers into the International Studies major are accepted on a competitive basis, depending upon space available. To apply for admission into the major, a student must have an overall GPA of 2.0 or higher (a GPA of 3.0 for second majors), must have taken IS 2054 and IS 2064 with grades of C or higher, and must have a GPA of 2.5 or higher in courses of the intended major.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education as amended for International Studies, and toward the degree in international studies.

To proceed satisfactorily toward a degree, a student must complete IS 2054, IS 2064, ECON 2005, ECON 2006 and Foreign language 2105 & 2106 by the end of the semester in which 60 hours have been attempted; must maintain an overall GPA of at least 2.0; must maintain an in major GPA of 2.5; and must achieve a minimum grade of C in both IS 2054 and IS 2064. It is recommended that students complete PSCI 3615 and PSCI 3616 before the end of the junior year.

Minor

The minor in international studies requires successful completion of 18 semester hours of course work, including the following required

courses (6 hours):

IS 2054: Intro. to World Politics
IS 2064: Global Economy and World Politics

The remaining 4 courses (12 semester hours) needed to complete the minor will be chosen from an approved list. An overall grade point average of 3.0 is required for acceptance into the minor.

Undergraduate Courses (IS)

2054 (GEOG 2054) (PSCI 2054): INTRODUCTION TO WORLD POLITICS
An introduction to the prevalent methods and theories in the study of world politics. Topics include: historical context of contemporary world politics, global actors and power relations, international conflict and conflict resolution, international systems, interdependence, trade and international law and prospects for global governance. (3H,3C)

2064 (GEOG 2064) (PSCI 2064): THE GLOBAL ECONOMY AND WORLD POLITICS
An introduction to the interaction of politics and economics power and wealth, within the world political economy. Topics include: the international financial system, the dynamics and principles of trade, and the role of transnational firms, as well as issues of environmental protections, sustainable development, and the distribution of wealth and power. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

3115,3116: SELECTED WORLD PROBLEMS
Selected world problems and how they affect various countries. Each semester, a topic will be chosen. (3H,3C)

3944: INTERNATIONAL ENROLLMENT
Participation in an approved study abroad program without direct supervision of the Va Tech faculty but with required enrollment in an approved program of study in a foreign university. (0C) I,II,III,IV,V.

3954: STUDY ABROAD
Variable credit course.

4004: SEMINAR IN INTERNATIONAL STUDIES
Interdepartmental seminar to synthesize and articulate basic assumptions, theories, and methods of international studies. Senior standing in IS and instructor consent required. (3H,3C) I, II.

4014: SEMINAR IN GRASSROOTS DEVELOPMENT
Utilizes development, gender, and social theory to examine the impact of aid programs on communities in the Third World. Analyzes such issues as the impact of development projects in agriculture, natural resources, and employment on the local people, the impact of aid on women; and the policies and administrative structures that direct the world of international development. (3H,3C) II.

4044 (COMM 4044): INTERNATIONAL COMMUNICATION
Comparative perspectives on global communication systems; problems with the flow of information; roles of international organizations; mass communication and national development; implications for conflict resolution; selected case studies. Senior standing required or instructor consent required. (3H,3C)

4754: INTERNSHIP
Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

College of Liberal Arts and Human Sciences

Music (School of Performing Arts & Cinema)

www.music.vt.edu

William J. Crone, Head
Professors: C. V. Burnsed; K. A. Holliday; J. R. Sochinski; D. R. Widder
Associate Professors: R. C. Cole; W. J. Crone; W. E. Easter; J. M. Floyd; W. J. Glazebrook; J. R. Howell; J. S. Husser; D. C. Jacobsen; E. Sheinberg
Assistant Professors: J. Adler; I. I. Bukvic; T. Cowden; T. Cross; B. Gendron; N. B. McDuffie; J. Miley
Instructors: M. E. Dunston; D. M. McKee; G. R. McNeill; W. Petersen; A. Weinstein
Career Advisor: 231-5685

Overview

The Virginia Tech Department of Music provides high-quality training to a select number of music majors, as well as ensembles and courses for large numbers of non-music majors. Instruction takes place in a handsome new facility which has superb rehearsal rooms, well-designed practice rooms and music teaching studios, a beautiful acoustically engineered Recital Salon, and laboratories with state-of-the-art electronic equipment for music study, recording, and digital music.

The curriculum offers an excellent liberal arts education with a low professor/student ratio combined with the library, computer facilities, and cultural interaction which only a major comprehensive university can provide. Learning is enhanced by the use of music technology across the curriculum and innovative programs such as laboratory ensembles and extensive teaching experiences in the music education program. Together with traditional degree programs in Performance, Music Education, and Theory/Composition, students may design a degree plan combining music with virtually all other majors offered by the university.

Virginia Tech faculty artists and scholars have performed and lectured at conventions, in music festivals, and on concert series throughout the United States and in Canada, Europe, Asia, and South America. Each year, internationally known guest artists join forces with our faculty to perform world calibre performances on campus.

Prospective music majors must successfully complete an audition/interview. Contact the chairperson of the Scholarship and Audition Committee, the Department of Music, 241 Squires Student Center, Blacksburg, Virginia 24061-0240 to receive information concerning auditions and scholarship opportunities. Scholarship support is available. Please also refer to the School of the Arts general information section for details.

The major in music, leading to a B.A., emphasizes four areas of music: music education; performance; theory/composition and designed option. This designed option area is provided as a means for a student to tailor music and non-music courses into a curriculum that best meets the interests of the student. In addition to fulfilling the Curriculum for Liberal Education and the core curriculum requirements of the College of Liberal Arts and Human Sciences, the music major must pursue a concentration in one of the above areas of emphasis.

There are five primary options available to music majors. These are:

- 84-Credit Music Education Option (see website for details)
- 78-Credit Performance Option
- 78-Credit Composition Option
- 50-Credit Designed Option – Liberal Arts
- 78-Credit Designed Option – Professional

There are pre-approved curricula in both of the designed options in the area of music technology. Pre-approved curricula also are available in the 50-credit Designed Option in performance and in composition.

In addition, all music majors must meet a minimum level of piano proficiency no later than two semesters prior to graduation. Music majors are expected to participate in an ensemble or as an accompanist every semester of residence and attend a minimum number of concerts and recitals. Additional curriculum and policy information is available in the *Handbook for Music Majors available* on the department website.

The minor in music consists of 18 semester hours selected from performance, history/literature, and theory/composition. Interested students should contact Dr. John M. Floyd, Virginia Tech, Department of Music, 247 Squires Student Center, Blacksburg, Virginia 24061-0240 or at (540) 231-5604 for the exact requirements.

The department follows the Curriculum for Liberal Education except in Area 4 - Scientific Reasoning and Discovery, of which two credits of laboratory science are not required. Both the Department of Music and the university foreign language requirement are the same, except for vocal performance majors.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics"), toward the Liberal Arts and Human Sciences College Core, and toward the degree in music.

Satisfactory progress toward the B.A. in Music requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

MUS 2025, 2026: Theory/Harmony	6
MUS 2045, 2046: Harmony/sightsinging Lab	2
MUS 3135, 3136: History and Analysis of Musical Styles	6
MUS 3145, 3146: Styles Lab	2
MUS 3314: Instrumental Ensemble Music **or** MUS 3414: Choral Ensemble Music	2
MUS 2514: Individual Applied Voice	2
Credits	**(20)**

2. Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.

Undergraduate Courses (MUS)

1005-1006: THEORY/FUNDAMENTALS
Development of understanding the basic components of the composition of music through reading and writing the symbolic notation as it appears on the page, and realizing the experimental and expressive content of music performance through singing, ear training, and practice at a keyboard instrument. (3H,3C) I,II.

1104: MUSIC APPRECIATION
Introduction to fundamental aspects of Western Art Music of major periods to give the student a basic understanding of the breadth and nature of this art form. (3H,3C) I,II.

2025-2026: THEORY/HARMONY
Study of structure, relationship, and function of chords through harmonization of bass and melody lines and through written analysis. Majors and minors only. Pre: 1006. Co: 2045, 2035 for 2025; 2036, 2046 for 2026. (3H,3C) I,II.

2035-2036: HARMONY LABORATORY
Aural study of rhythm, melody, and harmony, in conjunction with written and analytic studies in 2025-2026. Majors and minors only. Co: 2045, 2025 for 2035; 2026, 2046 for 2036. (3L,1C)

2045-2046: SIGHTSINGING LABORATORY
Study and practice of techniques involved in the sight reading and sightsinging of printed music. Majors and minors only. Co: 2035, 2025 for 2045; 2026, 2036 for 2046. (3L,1C) I,II.

2054: INTERMEDIATE MIDI APPLICATIONS
Application of intermediate MIDI techniques, MIDI hardware and MIDI software for music synthesis, transcription and performance. Fundamental musical acoustics and synthesizer programming. Fundamental digital sound processing and analog recording techniques. Prepares student to utilize music technologies effectively in teaching, performance and creative work. Pre: 2025. (3H,3C) II.

2055-2056: AUDIO TECHNOLOGY FOR MUSIC
Develops basic understanding of audio technology for musical applications, focusing on today's digital audio recording and editing technologies including microphone use, live recording, and studio session recording. Develops critical listening skills through lab experimentation and recording. Pre: 2054 and permission of instructor required. 2055: I, 2056: II Pre: 2054. (3H,3C)

2115,2116: SURVEY OF MUSIC
Music and composers of all historical periods will be heard and studied to acquaint the students with the music of Western Civilization. The emphasis will be on listening rather than on reading, writing, and performing music skills. (3H,3C) I,II.

2214: CLASS APPLIED PIANO
Group piano lessons for beginners or for students at an early stage of keyboard development. May be repeated for 1 credit. Consent required. (3L,1C) I,II.

2224: CLASS APPLIED VOICE
Group voice lessons for beginners or for students at an early stage of vocal development. May be repeated for 1 credit. Consent required. (3L,1C) I, II.

2234: CLASS APPLIED STRINGS
Group string lessons for beginners or for students at an early stage of string development. May be repeated for 1 credit. Consent required. I (3L,1C)

2244: CLASS APPLIED WOODWINDS
Group woodwind lessons for beginners or for students at an early stage of woodwind development. May be repeated for 1 credit. Consent required. (3L,1C) II.

2254: CLASS APPLIED BRASS
Group brass lessons for beginners or for students at an early stage of brass development. May be repeated for 1 credit. Consent required. (3L,1C) II.

2264: CLASS APPLIED PERCUSSION
Group percussion lessons for beginners or for students at an early stage of development. May be repeated for 1 credit. Consent required. I (3L,1C)

2274: MUSIC EDUCATION LAB ENSEMBLE
Music education laboratory ensemble. Performance techniques, teaching methods, management procedures, materials and literature for school music ensembles. May be repeated for credit. (1L,1C)

2284: PIANO ACCOMPANYING
Pianists will examine and practice the skills necessary for successful piano accompanying. The course will include sonata, concerto, vocal and choral literature. Pianists will be required to collaborate with vocal and instrumental students. Pre: consent required. (3H,3C)

2514: INDIVIDUAL APPLIED VOICE
Individual instruction in voice. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2515-2516: VOCAL DICTION
An introduction to principles of vocal diction for singing using the International Phonetic Alphabet and standard foreign-language pronunciation techniques. Two semesters. Fall semester: Italian, Latin, and English. Spring semester: French and German. One credit hour. Pre: 2514 or 4514. (1L,1C) I,II.

2524: INDIVIDUAL APPLIED KEYBOARD
Individual instruction in keyboard. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2534: INDIVIDUAL APPLIED VIOLIN
Individual instruction in violin. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2544: INDIVIDUAL APPLIED VIOLA
Individual instruction in viola. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2554: INDIVIDUAL APPLIED CELLO
Individual instruction in cello. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2564: INDIVIDUAL APPLIED BASS
Individual instruction in bass. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2574: INDIVIDUAL APPLIED FLUTE
Individual instruction in flute. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2584: INDIVIDUAL APPLIED OBOE
Individual instruction in oboe. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2594: INDIVIDUAL APPLIED CLARINET
Individual instruction in clarinet. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2614: INDIVIDUAL APPLIED SAXOPHONE
Individual instruction in saxophone. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2624: INDIVIDUAL APPLIED BASSOON
Individual instruction in bassoon. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2634: INDIVIDUAL APPLIED HORN
Individual instruction in horn. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2644: INDIVIDUAL APPLIED TRUMPET
Individual instruction in trumpet. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2654: INDIVIDUAL APPLIED TROMBONE
Individual instruction in trombone. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2664: INDIVIDUAL APPLIED BARITONE
Individual instruction in baritone. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2674: INDIVIDUAL APPLIED TUBA
Individual instruction in tuba. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2684: INDIVIDUAL APPLIED PERCUSSION
Individual instruction in percussion. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2714: INDIVIDUAL APPLIED HISTORICAL WIND INSTRUMENTS
Individual instruction in historical wind instruments. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2724: INDIVIDUAL APPLIED HISTORICAL STRING INSTRUMENTS
Individual instruction in historical string instruments. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2734: INDIDIVUAL APPLIED COMPOSITION
Individual instruction in composition. May be repeated. Consent and audition required. Variable credit course. I,II,III.

2815-2816: JAZZ IMPROVISATION
Fundamental principles of jazz improvisation. Topics include interval relationships, chord identification, modes and modality, blues and ii-V-I chord progressions. Pre: Permission of instructor required. 2815: I, 2816: II (2H,2C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3024: COUNTERPOINT
Study of the development and aesthetics of contrapuntal techniques throughout the common practice period. I Pre: 2026. (3H,3C)

3034: FORM AND ANALYSIS
Analysis of musical form by study of musical scores and aural development. Simple and large instrumental and vocal forms. Extensive listening. I Pre: 2025, 2026. (3H,3C)

3035-3036: ADVANCED EAR TRAINING & KEYBOARD HARMONY
Concentrated and integrated training in sight-singing, melodic, rhythmic and harmonic dictation, and related keyboard skills. Pre: 2036, 2046. (3L,1C) I,II.

3044: ORCHESTRATION & ANALYSIS
An introduction to the craft of scoring and arranging of music for full orchestra. Analysis of scores, small projects and a full orchestration project. Pre: 3034. (3H,3C) II.

3054: INTRODUCTION TO VOCAL/CHORAL ARRANGING
Techniques of arranging music for vocal/choral ensembles. Emphasis on transcription from recordings to develop rhythmic, melodic, and harmonic dictation skills. Discussion, transcription, listening, small writing exercises, final project. I Pre: 3035, 3036. (3H,3C)

3055-3056: MUSIC AND MEDIA PRODUCTION
Develops advanced knowledge of music production through practical application of music recording and production technologies, including advanced microphone techniques, critical listening, and critical artistic evaluation skills. Individual and group production projects. Hands-on experience with a variety of expressive media technologies including CD and DVD production in a collaborative, inter- disciplinary team approach. Pre: 2056 and continuation examination. 3055: I, 3056: II Pre: 2056. (3H,3C)

3065: COMPUTER MUSIC AND MULTIMEDIA DESIGN
A two-semester study of interactive multimedia composition and performance software as a foundation for creative work and research endeavors. Also provides an in-depth study of digital sound synthesis, algorithmic creation of multimedia content, and the design of audio-visual interactive systems using latest technologies. Must meet pre-requisite or have permission of the instructor Pre: 2054. (3H,3C)

3114: SYMPHONIC LITERATURE
Study of representative works of symphonic music from the eighteenth, nineteenth, and twentieth centuries, with corollary readings in the history of musical ideas. Consent required. II (3H,3C)

3115,3116: MUSIC IN AMERICA
An introduction to the history and stylistic evolution of American music from the seventeenth century to the present. (3H,3C) I,II.

3124: 20TH CENTURY MUSIC LITERATURE
An introduction to music in Europe and America since 1945; supplementary study in the aesthetics of contemporary music. Consent required. II (3H,3C)

3134: VOCAL MUSIC LITERATURE
Covers vocal music of Europe and America, especially music composed the eighteenth century. Examines differences in style and forms of choral and solo-vocal expression characteristic of the Baroque, Classic, Romantic, and Modern eras. Discusses issues of vocal performance practice. Ability to read music required. I (3H,3C)

3135-3136: HISTORY AND ANALYSIS OF MUSICAL STYLES
The history of Western music from 1100 to the present as an evolution of musical styles. Extensive analysis of the music, stylistic attributes, normative forms, and representative literature of each period. Historical and philosophical background of each period. The study of analytical techniques to improve comprehension and performance. Pre: 2026 for 3135; 2026, 3135 for 3136. Co: 3145 for 3135; 3146 for 3136. (3H,3C) I,II.

3144: EARLY MUSIC LITERATURE
Covers vocal and instrumental music from the Middle Ages to the eighteenth century. Examines differences in style and forms of expression characteristic especially of Medieval, Renaissance, and early Baroque music. Discusses issues of performance practice. Ability to read music required. (3H,3C) II.

3145-3146: MUSICAL STYLES LITERACY LABORATORY
Aural study of Western music from 1100 to the present as an evolution of musical styles. Extensive listening to the music of each stylistic period. Supervised as well as self-paced study using HyperMedia technology. Automated examinations. Co: 3136, 3135 for 3145; 3135, 3136 for 3146. (1L,1C) I,II.

3154: PIANO LITERATURE
Study of representative works of keyboard repertoire from the 17th century to the works of contemporary composers. Extensive stylistic analysis and discussion of performance practice. Pre: consent required. (3H,3C)

3204: MUSIC FOR CLASSROOM TEACHERS
Foundations and principles of music education for classroom teachers. Music methods and materials from early childhood to the middle school. (3H,3C) I,II.

3214: TEACHING MUSIC IN THE ELEMENTARY SCHOOL
Methods of teaching elementary school music. Emphasis on Kodaly, Orff, and traditional music textbook series approaches to teaching music in elementary schools. Pre: Instructor permission and successful completion of sophomore music continuation exam. Co: 4964. (3H,3C)

3225-3226: CONDUCTING
An introduction to the practice and theory of ensemble conducting and leadership. 3225: Basic conducting skills, and choral conducting. 3226: Intermediate conducting skills, and instrumental conducting. Consent required. (3H,3C) I,II.

3234: PIANO PEDAGOGY
Examination of principles and practice of piano pedagogy. Covers teaching methods, materials and literature for the independent studio teacher. Pre: consent required. (3H,3C)

3314: INSTRUMENTAL ENSEMBLE MUSIC
Instruction and participation in the various instrumental musical performance ensembles under direction of members of the music faculty. 3314 and/or 3414 may be repeated for a combined maximum of 8 hours. Consent and audition required. (3H,1C) I,II.

3414: CHORAL ENSEMBLE MUSIC
Instruction and participation in the various choral ensembles under the direction of the music faculty. 3314 and/or 3414 may be repeated for a combined maximum of 8 hours. Consent and audition required. (3H,1C) I,II.

3815-3816: ADVANCED JAZZ IMPROVISATION
Advanced principles of jazz improvisation. Topics include transcribing and transcription techniques, advanced ear training, study of various improvisational styles, memorization of standard forms and the aural recognition of both major and minor modes. 3815: I, 3816: II Pre: 2816. (2H,2C)

4054: MICROCOMPUTER APPLICATIONS IN MUSIC
Theory and practice of digital control and synthesis of music. MIDI data structures and programming from high-level languages. Comprehensive sequencing and transcription techniques. Musical acoustics; analog and digital hardware programming. Digital sound processing and recording. Contemporary music production techniques; industry applications. History and aesthetics of electronic music. Literary in traditional music notation. Working knowledge of any high-level programming language such as C, PASCAL, or FORTRAN required. (3H,3C) I,II.

4055-4056: MUSIC TECHNOLOGY SENIOR SEMINAR
Weekly seminars in music technology with group discussion of progress in current student projects, the current state of artistic and business practices in the recording industry, and guest lecturers drawn from the professional world. 4055: I, 4056: II Pre: 3056. (1H,1C)

4124: SPECIAL TOPICS IN MUSIC HISTORY AND LITERATURE
Specific, in depth study of one of several topics in music history and or literature. Pre: 2116. (3H,3C) I,II.

4204: REHEARSAL TECHNIQUES AND MATERIALS
Techniques and materials for rehearsing secondary school music performance ensembles. Pre: Instructor permission and successful completion of the sophomore music continuation exam. (3H,3C)

4514: ADVANCED INDIVIDUAL APPLIED VOICE
Individual instruction in voice at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2514. I,II,III.

4524: ADVANCED INDIVIDUAL APPLIED KEYBOARD
Individual instruction in keyboard at an advanced level. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2524. I,II,III.

4534: ADVANCED INDIVIDUAL APPLIED VIOLIN
Individual instruction in violin at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2534. I,II,III.

4544: ADVANCED INDIVIDUAL APPLIED VIOLA
Individual instruction in viola at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2544. I,II,III.

4554: ADVANCED INDIVIDUAL APPLIED CELLO
Individual instruction in cello at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2554. I,II,III.

4564: ADVANCED INDIVIDUAL APPLIED BASS
Individual instruction in bass at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2564. I,II,III.

4574: ADVANCED INDIVIDUAL APPLIED FLUTE
Individual instruction in flute at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2574. I,II,III.

4584: ADVANCED INDIVIDUAL APPLIED OBOE
Individual instruction in oboe at an advanced level. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2584. I,II, III.

4594: ADVANCED INDIVIDUAL APPLIED CLARINET
Individual instruction in clarinet at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2594. I,II,III.

4614: ADVANCED INDIVIDUAL APPLIED SAXOPHONE
Individual instruction in saxophone at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2614. I,II,III.

4624: ADVANCED INDIVIDUAL APPLIED BASSOON
Individual instruction in bassoon at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2624. I,II,III.

4634: ADVANCED INDIVIDUAL APPLIED HORN
Individual instruction in horn at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2634. I,II,III.

4644: ADVANCED INDIVIDUAL APPLIED TRUMPET
Individual instruction in trumpet at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2644. I,II,III.

4654: ADVANCED INDIVIDUAL APPLIED TROMBONE
Individual instruction in trombone at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2654. I,II,III.

4664: ADVANCED INDIVIDUAL APPLIED BARITONE
Individual instruction in baritone at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2664. I,II,III.

4674: ADVANCED INDIVIDUAL APPLIED TUBA
Individual instruction in tuba at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2674. I,II,III.

4684: ADVANCED INDIVIDUAL APPLIED PERCUSSION
Individual instruction in percussion at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2684. I,II,III.

4714: ADVANCED INDIVIDUAL APPLIED HISTORICAL WIND INSTUMENTS
Individual instruction in historical wind instruments at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2714. I,II,III.

4724: ADVANCED INDIVIDUAL APPLIED HISTORICAL STRING INSTRUMENTS
Individual instruction in historical string instruments at an advanced level. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2724. I,II,III.

4734: ADVANCED INDIVIDUAL APPLIED COMPOSITION
Individual instruction in composition at an advanced level. Majors only. May be repeated. Performance continuation exam required. Variable credit course. Pre: 2734. I,II,III.

4744: ADVANCED INDIVIDUAL APPLIED CONDUCTING
Individual instruction in conducting at an advanced level. May be repeated. Consent required. required. Variable credit course. Pre: 3225, 3226. I,II, III.

4815-4816: JAZZ ARRANGING
Contemporary harmonic practice and the craft of scoring and arranging music for modern jazz ensembles. Pre: 2026 and permission of instructor required. 4815: I, 4816: II Pre: 2026. (3H,3C)

4824: JUNIOR RECITAL
Preparation for a public half recital featuring performances of works by established or student composers, or lecture-demonstrations devoted to major works by established composers. Consent required. (1H,1C) I,II.

4834: SENIOR RECITAL
Preparation of a public full recital featuring performances of works by established or student composers, or lecture-demonstrations devoted to major works by established composers. Consent required. (1H,1C) I,II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Naval ROTC

www.usnavy.vt.edu/

Thomas G. Rubenstein, Capt., USN, Head
Professor: T. G. Rubenstein
Associate Professors: R. J. Fraenkel
Assistant Professors: C. M. Westhoff; J. P. Browning; D. E. Lee, II; J. J. Theriot; M. R. Weithman

Overview

The Naval Reserve Officers Training Corps (NROTC) offers eligible young men and women the opportunity to earn commissions in the Navy or Marine Corps. NROTC midshipmen are required to complete the naval science curriculum and attend weekly laboratory sessions. During summer vacations, midshipmen participate in active duty at-sea or shore-based training facilities for periods of approximately four weeks. Students may enroll in the NROTC Program at the start of college or at any time during their freshmen or sophomore years. Two-, three-, and four-year scholarships are available for those who demonstrate outstanding potential. Upon completion of university degree requirements and the naval science program, qualified midshipmen are commissioned as Ensigns in the Navy (Navy-option) or Second Lieutenants in the Marine Corps (Marine-option). Presently, all graduates are ordered to active duty within six months of graduation and receive full pay and allowances immediately upon commissioning.

Students may join NROTC through any one of the following four programs.

Four-Year National Scholarship Program

Students enter the NROTC Four-Year Scholarship Program through national competition and are appointed Midshipmen in the Naval Reserve. While enrolled the government provides tuition, fees, uniforms, book allowance, and a monthly allowance. Students complete required naval science courses and participate in three summer training periods of approximately four weeks each. Upon graduation midshipmen are commissioned with an obligation to serve on active duty for at least four years.

Two-Year National Scholarship Program

Sophomore students not in the NROTC Program may qualify for enrollment in the Two-Year Scholarship Program. Selection for this program is made by the Naval Service Training Command based on the student's academic record, physical qualifications, and an interview. Application begins at the NROTC Unit during the fall semester before the last two undergraduate years. Selected applicants attend six weeks of instruction at the Naval Science Institute (NSI) at Newport, Rhode Island during the summer following

application to bring them up-to-date on the NROTC curriculum missed during their freshman and sophomore years. Successful completion of NSI qualifies two-year applicants for appointment as midshipmen in the Naval Reserve and enrollment in the NROTC Scholarship Program. Upon acceptance of this appointment, these students receive all the benefits and assume all the obligations of midshipmen in the Four-Year Scholarship Program.

Four-Year College Program

Students are enrolled in the Four-Year College Program upon acceptance by the Professor of Naval Science. Uniforms and Naval Science textbooks are provided and, during their junior and senior years if accepted for advanced standing, College Program students receive a monthly allowance. College Program students are obligated to complete the prescribed naval science curriculum, attend one summer at-sea training period, accept a commission in the Naval Reserve or Marine Corps Reserve upon graduation, and serve on active duty after graduation a minimum of three years for Navy personnel and 3-1/2 years for the Marine Corps. After commissioning, application for transfer to the regular Navy or Marine Corps may be made.

Two- and Three-Year NSTC Controlled Scholarship Program

Students enrolled in the NROTC College Program and in good standing may be nominated by the Commanding Officer/Professor of Naval Science for a limited number of two- and three-year scholarships awarded by the Naval Service Training Command. If selected and found medically qualified, these students receive the same benefits and incur the same obligations as the Four-Year Scholarship Program.

Two-Year College Program

Sophomore students not in the NROTC Program may qualify for enrollment in the advanced Two-Year College Program by successfully completing the Naval Science Institute (NSI) program during the summer before their third academic year. Application is made to the Professor of Naval Science by the start of the spring semester of the sophomore year and, upon acceptance, students will receive all benefits and assume all obligations of Advanced Standing College Program midshipmen.

Requirements for All Candidates

Qualifications for acceptable candidates for the Scholarship Programs or the College Programs include: U.S. citizenship; membership in the Virginia Tech Corps of Cadets; fulfillment of physical examination requirements; and willingness to participate in required summer training periods and to accept the appropriate commission in the Navy, Marine Corps, Naval Reserve, or Marine Corps Reserve when offered.

If not included in the requirements of their majors or the Curriculum for Liberal Education and college core curriculum, NROTC Navy-option scholarship students must complete the following: one year of college calculus through differential and integral calculus of one real variable; one year of calculus-based physics; one year of American military affairs or national security policy; one year of English; and an Area 2 class approved by your ROTC advisor.

During NROTC enrollment, each midshipman also will be required to pass semiannual physical fitness tests and to qualify as a swimmer before going on summer cruise.

Emerging Leader Scholarship Program

The university, in conjunction with the Virginia Tech Corps of Cadets Alumni Association, is offering a scholarship to incoming freshmen who are enrolled in an ROTC program and become members of the Corps of Cadets. Contact the Virginia Tech Corps of Cadets for more information.

Leadership Minor

Students participating in the Virginia Tech Corps of Cadets are eligible for a minor in leadership based on the training and experience they gain while a member of the Corps. Students who complete one of the three ROTC programs may qualify to receive the minor when they complete their bachelor's degree. Contact the Center for Leader Development for more information.

Course Descriptions (MN)

1004: INTRODUCTION TO NAVAL SCIENCE

Naval profession and concept of seapower. Missions and organization of Navy and Marine Corps. Overview of naval concerns, customs, traditions, seamanship, regulations, and military justice. I (3H,3C)

1104: NAVAL SHIPS SYSTEMS I: ENGINEERING
Ship characteristics and types. Includes ship design, hydrodynamic forces, stability, main propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control. One semester of college level science required. Pre: 1004. (3H,3C) I,II.

2004: NAVAL SHIPS SYSTEMS II: WEAPONS
Theory and employment of naval weapons systems. Includes threat detection, evaluation, weapon selection, delivery systems, guidance, and warhead design. Elements of command, control, and communications. (3H,3C) I,II.

2104: SEAPOWER AND MARITIME AFFAIRS
A survey of naval history from the American Revolution to the present with emphasis on major developments in strategy, tactics, and technology. Discussion of the geopolitical theory of Alfred Thayer Mahan. Explores present concerns in seapower and maritime affairs, including the economic and political dimensions of ocean commerce, the Law of the Sea, a comparison of U.S. and Soviet maritime strategies, and current naval affairs. (3H,3C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3005-3006: NAVIGATION AND NAVAL OPERATIONS
3005: An in-depth study of the theory and practice of piloting and introduction to celestial navigation. Students develop practical skills in the use of charts, visual and electronic aids. A study of the International Rules of the Nautical Road. 3006: Relative motion, vector-analysis theory, and ship employment. Includes an introduction to naval operations, ship characteristics, shiphandling, and afloat communications. I (3H,3C)

3204: EVOLUTION OF WARFARE
Development of warfare focusing on impact of major military theorists, strategists, and technicians. Ancient times to present. I Pre: 2104. (3H,3C)

4005-4006: LEADERSHIP AND MANAGEMENT/ETHICS
Advanced-level study of leadership and management theory, including planning, organizing, communication, decision-making, and individual and group behavior. Explores major behavioral theories; practical applications involve experiential exercises, case studies, and laboratory discussions. 4006: Ethics and management in the Navy. Includes study of professionalism and ethics, human resources development, counseling, military law, personnel evaluation, administration, and material management. Pre: SOC 1004. (3H,3C) I,II.

4204: AMPHIBIOUS WARFARE
Historical survey of the development of amphibious doctrine and the conduct of amphibious operations. Emphasis is on amphibious operations in World War II. Present day potential and limitations on amphibious operations are explored. I (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.
II.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Philosophy

http://www.phil.vt.edu/

James C. Klagge, Chair
Professors: J. C. Klagge; D. G. Mayo; J. C. Pitt
Associate Professors: W. FitzPatrick; W. Ott
Assistant Professors: S. Daskal; S. May; D. Parker; L. Patton
Adjunct Professors: J. M. Buchanan (University Distinguished Professor Emeritus of Economics and Philosophy)
Career Advisor: J. C. Pitt (231-4564)
Emeritus: R. Burian; H. B. Miller; P. Talbutt

Overview

Courses in philosophy aim at critical understanding and rigorous evaluation of the concepts underlying our views concerning the nature of reality, what sorts of things there are, what can be known, what is of value, and what people ought to do and to aim at. The department offers programs leading to the B.A. and to the M.A. Philosophy majors receive a strong liberal arts education and are prepared for careers that require a broad perspective and independent judgment. They are prepared for graduate work in a variety of scholarly and professional fields. An undergraduate philosophy major is especially appropriate for the student considering law school or other professional schools. In addition, philosophy may be chosen as a minor.

Philosophy majors must complete the college core and the Curriculum for Liberal Education and successfully complete at least 30 hours in philosophy, including three courses in the history of philosophy, and 3505 (Symbolic Logic). At least 9 of the 30 hours must be at the 3000 level or above, with at least 3 of these hours at the 4000 level. In addition, a strong second area of concentration is chosen by each major student; it will consist of at least 18 credit hours [including courses as part of the Liberal Education requirements] in one discipline or in a set of closely related disciplines other than philosophy. At least 6 of these 18 hours must be at the 3000 level or above. A double major is possible with any of several other curricula.

Philosophy minors must complete at least 18 hours of philosophy, including one of 1504 or 3505, and 9 hours selected from among courses in the history sequence (2115, 2116, 2125, 2126) and at the 3000 or 4000 level. The total minor program must be approved by the department.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics in this catalog), toward the Liberal Arts and Human Sciences College Core, and toward the degree in philosophy.

Satisfactory progress toward the B.A. in philosophy requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

Philosophy	12
Total Credits	**(12)**

2. Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.

Course Descriptions (PHIL)

1204: KNOWLEDGE AND REALITY
Examines the questions: What is the nature of reality? How do I know what is real and what is misleading appearance, error, or illusion? What is knowledge? How do I find out who I am and how I relate to the world around me? (3H,3C)

1304: MORALITY AND JUSTICE
A critical survey of theories concerning human nature, the meaningful life, and the moral evaluation of actions, persons, and institutions. Theories will be applied to such issues as abortion, justice, and moral problems faced by professionals. (3H,3C)

1504: LANGUAGE AND LOGIC
Basic concepts in logic and critical thinking: argument, validity, deduction and induction, logical form, formal and informal fallacies. Introduction to the logic of truth functions and of categorical statements. Critical analysis of arguments in ordinary language. (3H,3C)

2115,2116: ANCIENT THROUGH MEDIEVAL PHILOSOPHY
Western philosophical thought through the medieval period. 2115: ancient philosophy, including Presocratics, Socrates, Plato, and Aristotle. 2116: main trends in Post-Aristotelian Greek and Roman philosophy and medieval philosophy, including Augustine, Aquinas, and Ockham. (3H,3C)

2125,2126: HISTORY OF MODERN PHILOSOPHY
Western philosophical thought from Descartes through Kant. 2125: 17th Century Philosophy, including Descartes, Spinoza, Leibniz, and Locke. 2126: 18th century philosophy, including Berkeley, Hume and Kant, with special attention to significant predecessors. (3H,3C)

2304: GLOBAL ETHICS
Ethical issues in international context. Application of the principles of moral theory to such issues as the obligations of richer nations toward poorer ones, cultural and other forms of relativism, emigration and immigration, nationalism, war, deterrence, intervention, environmental degradation, preservation of natural diversity, and responsibilities toward future generations. (3H,3C)

2605,2606: REASON AND REVOLUTION IN SCIENCE
Study of philosophical approaches to understanding and justifying modes of human reasoning both in science and everyday life. 2605: nature of theory confirmation and falsification; 2606: justifying changing paradigms of human inquiry. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3015,3016 (PSCI 3015, 3016): POLITICAL THEORY
Analysis of the fundamental ideas in the history of political theory. 3015: Plato to the 17th century. 3016: late 17th century to the present. I Pre: PSCI 2014. (3H,3C)

3024: PHILOSOPHICAL MOVEMENTS
This course focuses on the assumptions and methods of one or more contemporary or historically important movements in philosophy such as Existentialism, Feminism, Local Positivism, Phenomenology, Pragmatism, or Naturalism. Pre-requisite: 3 Philosophy credits required. May be repeated twice for credit under different topics, up to 9 hours total. (3H,3C)

3314: ETHICAL THEORY
Careful examination of some important historical or contemporary ethical theories. Includes coverage of such topics as the assessment of character and action, the foundations of ethical theories, their justification, their relationship to scientific theories, and their objective or subjective status. 3 Philosophy credits required. (3H,3C)

3414: AESTHETICS
Studies the basic concepts used in the analysis and evaluation of art works; considers problems of art criticism as treated within major types of aesthetic theory. (3H,3C)

3454: PHILOSOPHY OF RELIGION
A consideration of religious belief and its justification with attention to such philosophical issues as the nature and existence of God, the problem of evil, and the notion of faith. (3H,3C)

3505-3506: MODERN LOGIC AND ITS DEVELOPMENT
Logic and logical theory and the history of its development. 3505: Validity of arguments. Syllogistic logic from Aristotle to modern times. Deductive methods in truth functional and quantificational logic through the theory of identity. Translation from English into symbolic form.
3506: Metalogic and the history and philosophy of modern logical theory. Decidability and undecidability, completeness and incompleteness of formal systems. Developments from Cantor to Goedel. (3H,3C)

4015,4016: SPECIAL TOPICS IN PHILOSOPHY
Critical examination of special issues of current philosophical interest. 3 Philosophy credits required. (3H,3C)

4204: PHILOSOPHY OF MIND
Current issues in the philosophy of mind such as relation of mind and body, status of the mental, knowledge of one's own and other minds, personal identity, consciousness, mentality of animals and machines, topics in the philosophy of psychology. 3 Philosophy credits required. (3H,3C)

4214: METAPHYSICS
Examination of some of the central problems of metaphysics. Topics may include: existence, necessary truth, the problem of universals, causation, the identity of the self through time, free will. Attention will be given both to the historical development of these problems and to contemporary

philosophical responses to them. 3 Philosophy credits required. (3H,3C)

4224: EPISTEMOLOGY
Theory of knowledge. Is all knowledge based on experience? Does knowledge have a foundation? Can knowledge of the present and the nearby give us reasons for beliefs about the future, the past, or about events far away? 3 Philosophy credits required. (3H,3C)

4304: TOPICS IN SOCIAL & POLITICAL PHILOSOPHY
Study of topics such as distributive justice, equality exploitation, alienation, individual rights, anarchy, constitutional government, the justification of political authority, and liberation. Topics to be announced each semester course is offered. 3 Philosophy credits required. (3H,3C)

4324 (MGT 4324): BUSINESS AND PROFESSIONAL ETHICS
An inquiry into the fundamental norms of conduct in business and other professions and their justification in relation to the most important ethical theories. Special attention will be given to moral problems such as the ethics of hiring and firing, bribery, and professional responsibility to society. (3H,3C)

4334: JURISPRUDENCE
An examination of the nature of law and legal systems with attention to traditional theories of law and to such topics as judicial decision and discretion, law and morality, the justification of legal coercion. 3 Philosophy credits required. (3H,3C)

4514: SPECIAL TOPICS IN LOGIC
Topics that build upon a knowledge of classical deductive logic: extensions of classical logic, alternatives to classical logic, philosophy of logic, and philosophy of language. Topics to be announced each semester course is offered. Pre: 3505. (3H,3C)

4604: PHILOSOPHY OF BIOLOGY
This course is designed primarily for students of biology or philosophy students with a strong interest in biology. Topics vary from year to year, but include the changing character of biology as a science, the special character of biological explanations and methods, and the place and value of reduction (e.g., of Mendelian to molecular genetics) in biology. One course at the 3000 level or higher in biology and 3 credits in philosophy required. (3H,3C)

4614: PHILOSOPHY OF SCIENCE
An examination of the structure and methodology of science as well as key concepts such as explanation, confirmation, realism, and instrumentalism. One year of science and 3 philosophy credits required. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Liberal Arts and Human Sciences

Political Science

www.psci.vt.edu/

Ilja A. Luciak, Chair
University Distinguished Professor: T. W. Luke
Edward S. Diggs Professor in the Social Sciences: E. Weisband
Professors: K. M. Hult; I. A. Luciak; W. Natter; R. C. Rich; C. L. Taylor; C.E. Walcott
Associate Professors: C. L. Brians; D. J. Milly; W. D. Moore; R. D. Shingles; I. Stivachtis; L. Zanotti
Assistant Professors: P. Hoon; B. Koch; C. Lavin; S. G. Nelson
Internship Director: R. C. Rich (231-5323)

Overview

The department offers courses leading to degrees in Political Science and International Studies. These courses provide understanding of political systems, forms of government, and political processes throughout the world. Political science courses also offer preparation for careers in government, business, law, politics, and education.

General Option for the B.A. Degree

In addition to required courses in the Curriculum for Liberal Education and the department's general education requirements, a student majoring in political science must complete the following:

1. PSCI 1014: Introduction to United States Government and Politics;
2. PSCI 1024: Introduction to Comparative Government and Politics;
3. PSCI 2014: Introduction to Political Theory;
4. PSCI 2024: Research Methods in Political Science;
5. PSCI 2054: Introduction to World Politics or PSCI 2064: Global Economy and World Politics;
6. 24 hours of political science electives (of which 21 at the 3000 or 4000 level);
7. 12 hours in 3000-4000 level courses in *one* of these related disciplines:
   Agricultural and Applied Economics, Communication, Economics, English, Geography, History, Philosophy, Psychology, Sociology, Urban Affairs and Planning, or a single foreign language.

Legal Studies Option for the B.A. Degree

This option is intended to help students gain appreciation of one of western civilization's greatest intellectual achievements: the structure and application of the law. The option is not intended to be a pre-law program, although students hoping to attend law school may enroll for the option and may well benefit from its completion. In addition to meeting the requirements of the Curriculum for Liberal Education and the department's general education requirements, a student taking the legal studies option must complete:

1. PSCI 1014: Introduction to United States Government and Politics;
2. PSCI 1024: Introduction to Comparative Government and Politics;
3. PSCI 2014: Introduction to Political Theory
4. PSCI 2024: Research Methods in Political Science;
5. PSCI 2054: Introduction to World Politics or PSCI 2064: Global Economy and World Politics

6. Two of the following courses:
   PSCI 3354: Constitutional Law: Structures and Relationships;
   PSCI 3364: Constitutional Law: Civil and Political Rights;
   PSCI 3334: Judicial Process;
   PSCI 4324: Senior Seminar in Constitutional Law.
7. PHIL 1204: Knowledge and Reality;
8. PHIL 1304: Morality and Justice;
9. 18 hours of political science electives (of which 15 at the 3000 or 4000 level);
10. 12 hours of courses from among the following:

    AAEC 3314: Environmental Law
    AAEC 3604: Agricultural Law
    AAEC 4754: Real Estate Law
    COMM 4024: Communications Law and Ethics
    ECON 4894: Law and Economics
    ENGL 3684: Literature and the Law
    FIN 3055: Legal Environment of Business
    FIN 4004: Wills, Trusts, and Estates
    FIN 4014: Internet Law
    HIST 4224: Legal and Constitutional Topics
    HD 4354: The Family, Law, and Public Policy
    PHIL 4334: Jurisprudence
    SOC 3414: Criminology
    SOC 4404: Sociology of Law
    UAP 4754: Legal Foundations of Planning

Minor

A minor in political science may be obtained by completing:

1. PSCI 1014: Introduction to United States Government and Politics;
2. PSCI 1024: Introduction to Comparative Government and Politics;
3. PSCI 3015 or 3016: Political Theory; or PSCI 2014: Introduction to Political Theory;
4. 9 hours of political science electives (of which 6 at the 3000 or 4000 level).

An overall grade point average of 3.0 is required for acceptance into the minor.

Internal Transfers

Transfers into the Political Science major are accepted on a competitive basis, depending upon space available. To apply for admission into the major, a student must have an overall GPA of 2.0 or higher (a GPA of 3.0 for second majors), must have taken PSCI 1014 and PSCI 1024 with grades of C or higher, and must have a GPA of 2.5 or higher in Political Science courses already taken.

Regarding Double Majors

The Department of Political Science offers majors in both Political Science and International Studies. Courses for the two majors overlap significantly. Therefore, students may not pursue both majors simultaneously, nor major in one and minor in the other.

Advising

The department provides advisors to help students understand and meet degree requirements. Career counseling also is available in the department, as is advising for students interested in attending law school after graduation from Virginia Tech.

The department arranges academic credit for internships in state, local, and federal governments, nonprofit organizations, and other appropriate settings. The department's internship program offers students a chance to gain career-related experience in a wide variety of organizations. Information on these opportunities can be obtained from the internship director.

To provide opportunities for informal association of faculty and students, the department sponsors the Political Science Club, a chapter of Phi Alpha Delta, the pre-law honor fraternity, a chapter of Pi Sigma Alpha, the national honor society in political science, and other student organizations. Information about these activities, as well as about any other aspect of the department, may be obtained from the department chair, advisors, or the department office.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the department's general education requirements, and toward the degree in Political Science.

Satisfactory progress toward the B.A. in political science requires completion of PSCI 1014, 1024, and 2024 within the first 60 credit hours attempted. Students must also maintain an in-major GPA of 2.5 and must achieve a minimum grade of C in both PSCI 1014 and 1024.

Study Abroad

Virginia Tech offers a variety of study abroad programs, including a summer program in London and a spring semester at the European Studies Center in the university's own facilities in Switzerland.

Honors

Honors courses are offered in Political Science. Majors in the department also may be admitted into the University Honors Program. In this program, they may choose among a variety of honors diplomas. Two of these require a senior honors thesis written under the direction of a faculty member in the department.

Undergraduate Course Descriptions (PSCI)

1004 (SPIA 1004): NATIONS AND NATIONALITIES
Introduction to world and American ethnic and indigenous cultures and to social constructions of human and group identity, nationalism and extreme ethno-nationalism. Music, dance, film, art, ceremonial rituals and other multimedia forms of creative or symbolic expression, supplement readings and lectures. Multidisciplinary exploration of collective conceptions of cultural differences. (3H,3C)

1014: INTRODUCTION TO UNITED STATES GOVERNMENT AND POLITICS
Government and politics of the United States; the Constitution, political culture, interest groups, political parties, elections, Congress, bureaucracy, presidency, and federal courts; selected current policy issues. (3H,3C) I,II,III,IV.

1014H: HONORS INTRODUCTION TO UNITED STATES GOVERNMENT AND POLITICS
(3H,3C)

1024: INTRODUCTION TO COMPARATIVE GOVERNMENT AND POLITICS
Government and politics of selected countries outside the United States; nature of politics and government, types of political systems, linkages of people and governments, and current political issues. (3H,3C) I,II,III,IV.

1024H: HONORS INTRODUCTION TO COMPARATIVE GOVERNMENT AND POLITICS
(3H,3C)

2014: INTRODUCTION TO POLITICAL THEORY
Examines central themes involved in the practices of normative political theory. Topics will include critical review of the historical origins, established traditions, and major themes in normative political thinking. (3H,3C)

2024: RESEARCH METHODS IN POLITICAL SCIENCE
Introduction to research in political science; formulation of theory, operationalization and measurement, gathering, analysis and interpretation of data. Pre: 1014 or 1014H, 1024 or 1024H. (3H,3C) I,II,III,IV.

2054 (GEOG 2054) (IS 2054): INTRODUCTION TO WORLD POLITICS
An introduction to the prevalent methods and theories in the study of world politics. Topics include: historical context of contemporary world politics, global actors and power relations, international conflict and conflict resolution, international systems, interdependence, trade and integration, international law and prospects for global governance. (3H,3C)

2064 (GEOG 2064) (IS 2064): THE GLOBAL ECONOMY AND WORLD POLITICS
An introduction to the interaction of politics and economics power and wealth, within the world political economy. Topics include: the international financial system, the dynamics and principles of trade, and the role of transnational firms, as well as issues of environmental protection, sustainable development, and the distribution of wealth and power. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3015,3016 (PHIL 3015, 3016): POLITICAL THEORY
Analysis of the fundamental ideas in the history of political theory. 3015: Plato to the 17th century. 3016: late 17th century to the present. I Pre: 2014. (3H,3C)

3214: POLITICAL PARTICIPATION
Levels and types of political participation; reasons for participation; who participates and why; effects of political activity on political processes. I Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3224: PUBLIC OPINION
Sources and distribution of public opinion; measurement of public opinion; relationships between public opinion and public policy; institutions linking public opinion to government decisions. I Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3234: VOTING AND ELECTIONS
Voting, elections, and support for political parties and party leaders in the United States and other Western democracies; impact of economic conditions on political support and patterns of realignment and dealignment. I Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3244 (COMM 3244): POLITICAL COMMUNICATION
Distribution of political information; elite-mass communication; alternative models of political communication; communication and telecommunications policy. Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3255,3256: THE POLITICS OF RACE, ETHNICITY AND GENDER
Studies the status and political behavior of selected political minorities. 3255: compares African-, Mexican- and Native-Americans. 3256: examines diverse political responses to traditional gender roles, current gender issues, and the unique gender problems facing people of color. I (3H,3C)

3264: INTEREST GROUPS
Formation, structure, activities, and regulation of interest groups; comparison of American interest groups with those in other countries; evaluation of interest groups as participants in the political process. I Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3274: POLITICAL PARTIES
Development, organization, activities, and personnel of political parties; citizens' partisan attitudes and behavior; origins, characteristics, stability, and changes of party systems. I Pre: 1014 or 1014H or 1024 or 1024H. (3H,3C)

3314: CONGRESS
Congressional structure; organization and procedure; characteristics of members of Congress; Congressional elections; decision-making and external influences; change and reform. I Pre: 1014 or 1014H. (3H,3C)

3324: THE PRESIDENCY
Election, institutionalization, staffing, relations with Congress, and the bureaucracy; initiation and implementation of public policy. Pre: 1014 or 1014H. (3H,3C) II.

3334: JUDICIAL PROCESS
Structure and functions of American legal institutions; participants in the process, impact of legal institutions on society. Pre: 1014 or 1014H. (3H,3C) II.

3344 (UAP 3344): GLOBAL ENVIRONMENTAL ISSUES: INTERDISCIPLINARY PERSPECTIVES
Critical examination of major global environmental problems (e.g., global warming, atmospheric ozone depletion, acid rain, tropical deforestation, toxic waste) with emphasis on their social, economic, political, ethical, and policy implications and solutions. Pre: completion of Area 4 of University Core. (3H,3C) II.

3354: CONSTITUTIONAL LAW: STRUCTURES AND RELATIONSHIPS
Power and authority of president, Congress, and courts; division of powers between states and federal government. Pre: 1014 or 1014H. (3H,3C)

3364: CONSTITUTIONAL LAW: CIVIL AND POLITICAL RIGHTS
Civil rights and liberties; rights of criminal defendants; competing conceptions of constitutional rights. Pre: 1014 or 1014H. (3H,3C)

3414 (UAP 3434): PUBLIC ADMINISTRATION
The role and context of public administration in the contemporary United States, administrative organization and decision-making, public finance, human resources administration, and program implementation. Pre: 1014 or 1014H. (3H,3C)

3424: STATE AND LOCAL GOVERNMENT
Institutions, functions, and policies of state, county, and municipal governments in the U.S.; issues confronting these governments in the federal system. I Pre: 1014 or 1014H. (3H,3C)

3434: URBAN POLITICS
Basic concepts of urban politics; governmental structures, policy processes, and political conflicts in U.S. cities, policy options for coping with urban problems. Pre: 1014 or 1014H. (3H,3C) II.

3444 (UAP 3444): ADMINISTRATIVE LAW AND POLICY
The legal context of the exercise of discretion by public administrators in the United States. Adjudication and rule- making; access to administrative processes and information; legislative and judicial control of administration.
Pre: 1014 or 1014H. (3H,3C)

3514: LATIN AMERICAN GOVERNMENT AND POLITICS
Introduction to the political systems of Latin American countries, including legislative-executive relations, interest groups, political parties, electoral systems, political violence, and socio-political development. Pre: 1014H or 1024. (3H,3C) II.

3515,3516: EUROPEAN POLITICAL SYSTEMS
The government and politics of selected European states and of the European Union. 3515: normally includes the United Kingdom. 3516: normally includes Germany and Hungary. I Pre: 1024 or 1024H. (3H,3C)

3524: POLITICS OF POST-COMMUNIST SYSTEMS
Institutions, party structures, political economy, elite politics, ethnic conflicts, leadership dynamics, and mass political behavior in Russia and other post-communist political systems. Pre: 1024 or 1024H. (3H,3C) II.

3534: AFRICAN GOVERNMENT AND POLITICS
Survey of major concepts and themes in the study of African politics and development: analyses of the state, political institutions, social forces, democratization, sustainable development, issues of contemporary African politics. I Pre: 1024 or 1024H. (3H,3C)

3544 (JUD 3544): THE STATE OF ISRAEL: A POLITICAL HISTORY
This course provides a survey on the political history of the State of Israel and highlights major themes uniquely characterizing the specific events surrounding its establishment and its first 50 years of existence. Additionally, the course will add a comparative dimension by using the political history of Israel as a case study to discuss major themes in political science such as democracy, government, political economy, etc. PSCI 1024 or JUD 2134. Pre: 1024 or 1024H or JUD 2134. (3H,3C) II.

3554: COMPARATIVE POLITICAL ECONOMY
Economic policies and collective choice processes of pre-industrial, industrializing, and advanced industrial states; problems and crises of industrial development, economic distribution, and technological transfer in the transition from an agrarian to advanced industrial society. Pre: 1024 or 1024H. (3H,3C) II.

3564: VIOLENT POLITICAL CHANGE
Historical origins, political processes, and institutional outcomes of violent political change, rising from mass protest movements, revolutionary organization, military coups, and radical political parties. I Pre: 1024 or 1024H. (3H,3C)

3574: GOVERNMENT AND POLITICS OF JAPAN
Introduction to governmental institutions, patterns of political organization and behavior, and key policies of the Japanese political system. I Pre: 1024 or 1024H. (3H,3C)

3584: GOVERNMENTS AND POLITICS OF ASIA
Introduction to governmental institutions, political behavior, and social and economic policy approaches of China and other selected countries in the Asian region. I Pre: 1024 or 1024H. (3H,3C)

3615-3616: INTERNATIONAL RELATIONS
Structure and development of the modern international system; theories of international politics; international law; international organizations. I Pre: IS 2054 or PSCI 2054 or GEOG 2054 or PSCI 2064 or IS 2064 or GEOG 2064 for 3615; 2054 or IS 2054 or GEOG 2054 or PSCI 2064 or IS 2064 or GEOG 2064 for 3616. (3H,3C)

3625,3626: FOREIGN POLICIES OF THE SUPER POWERS
3625: Formulation of American foreign policy; roles of the President, Congress, press, public, and bureaucracy; central themes, issues, and problems of American diplomacy; 3626: Development and operational practices of Russian foreign policy decision-making in the international environment; party and state political institutions; Marxist-Leninist ideology. I Pre: 1024 or 1024H. (3H,3C)

3684 (AINS 3684): INDIGENOUS PEOPLES AND WORLD POLITICS
A survey of the historical and contemporary struggles of indigenous peoples throughout the world. Examines the dynamics of colonialism (internal and external), identity construction, gender, cultural integrity, and the ongoing global indigenous rights discourse. In addition to covering broad global processes/theoretical approaches, comparative case studies of particular indigenous groups, such as the Maasai (Kenya, Tanzania) and Mayans (Mexico, Guatemala, Belize), are used to highlight the global, regional and intra-community diversity among contemporary indigenous peoples. (3H,3C)

3714 (UAP 3714): THE U S POLICY PROCESS
Description and analysis of the processes and institutions involved in the making and implementation of public policy in the United States, with a primary focus on domestic and economic policy. Empirical and normative models of the process of public policy making in the U.S. I Pre: 1014. (3H,3C)

3724: POVERTY AND WELFARE POLICY
Public policies regarding the poor, impact of current policies; future policy options. I Pre: 1014 or 1014H. (3H,3C)

3734: NATIONAL SECURITY
Post-1945 strategic problems, policies, and security commitments of major participants in international politics, especially the United States and Russia; effects of security policies on international and domestic political economies. I Pre: 2054 or IS 2054 or GEOG 2054. (3H,3C)

3744 (UAP 3744): PUBLIC POLICY ANALYSIS
Methods and approaches used in the analysis and evaluation of public policy; strengths and limitations of various analytic tools; normative issues in the practice of policy analysis. Pre: 1014 or 1014H. (3H,3C) II.

3754: AMERICAN POLITICAL THEORY
American political theory from the pre-Revolutionary era to the present. American contribution to the understanding of freedom, equality, political community, constitutionalism, political dissent, and the welfare state. I Pre: 1014 or 1014H. (3H,3C)

3764: CONTEMPORARY DEMOCRATIC THEORY
History and critiques of classical theories of democracy; contradictions within and contemporary problems facing democracy; future of democracy according to conservative, liberal, and radical theoretical perspectives. Pre: 2014, (3015 or 3016). (3H,3C) II.

3774 (UAP 3774): MARXIAN POLITICAL ANALYSIS
Contemporary uses of Marxian concepts and theories to study the world economy, business structure, current social issues, modern ethical values, and alienation. Pre: 2014, (3016 or 3554). (3H,3C) II.

3784: ORIGINS OF THE STATE
Theories of the origins of politics and government; evidence of state formation in prehistoric societies; political behavior in contemporary pre-literate societies as precursor to state formation. Pre: 2014, (3015 or 3016). (3H,3C) II.

4214: SENIOR SEMINAR IN POLITICAL BEHAVIOR
Political behavior: socialization, voting, opinion formation and expression, decision-making in government, as explained by personality, rationality, culture, class, and institutional roles. Topics vary from semester to semester as announced. Must have senior standing. Pre: 3214 or 3224 or 3234 or 3244 or 3264 or 3274. (3H,3C)

4314: SENIOR SEMINAR IN POLITICAL INSTITUTIONS
Selected topics in political institutions, including decision-making, types and structures of political institutions, internal and external influences on institutional behavior. Topics vary from semester to semester. Must have senior standing. X-grade allowed. Pre: 3314 or 3324 or 3334 or 3515 or 3516 or 3524. (3H,3C)

4314H: HONORS SENIOR SEMINAR IN POLITICAL INSTITUTIONS
X-grade allowed. (3H,3C)

4324: SENIOR SEMINAR IN CONSTITUTIONAL LAW
Cases, law review articles, and related materials containing describing, or commenting on major decisions of the U.S. Supreme Court. Topics vary from semester to semester as announced. Must have senior standing. Pre: 3354 or 3364. (3H,3C)

4414: SENIOR SEMINAR IN PUBLIC ADMINISTRATION
Selected topics in public administration, including norms of practice, government personnel, administrative process, administrative law, privatizing, and contracting. Topics vary from semester to semester as announced. Must have senior standing. Pre: 3414 or 3424 or 3444. (3H,3C)

4514: SENIOR SEMINAR IN COMPARATIVE POLITICS
Selected topics in the comparative analysis of political behavior, processes, and institutions; cross-national institutional and aggregate data analysis. Topics vary from semester to semester as announced. Must have senior standing. Pre: 3515 or 3516 or 3524 or 3554 or 3564 or 3514 or 3534 or 3544 or 3574. (3H,3C)

4614: SENIOR SEMINAR IN INTERNATIONAL RELATIONS
Selected topics in international relations, including objectives of national policy, dimensions and components of national power, comparative diplomacy, international conflict and cooperation, instruments for conflict resolution. Topics vary from semester to semester as announced. Must have senior standing and any two of the prerequisites. Pre: 3615 or 3616 or 3625 or 3626 or 3734. (3H,3C)

4624 (UAP 4624): THE WASHINGTON SEMESTER: SEMINAR IN AMERICAN POLITICS AND PUBLIC POLICY
This seminar is the integrative forum for the principal elements of the Washington Semester experience. The course explores both the role of political institutions in policy formation and implementation and the primary managerial and leadership challenges that arise for implementing organization managers in American democratic public policy-making. PRE: Junior standing or instructor consent and acceptance into the Washington Semester program. X-grade allowed. (3H,3C) III,IV.

4624H (UAP 4624H): HONORS THE WASHINGTON SEMESTER: SEM IN AMERICAN POLITICS AND PUBLIC POLICY
X-grade allowed. (3H,3C)

4644 (UAP 4644): THE WASHINGTON SEMESTER: POLITICS, POLICY AND ADMINISTRATION IN A DEMOCRACY
This course is part of the Washington Semester. Explores the relationship between the imperatives of democratic mobilization, policy choices and organizational choices through intensive study of the operating context of a selected public or nonprofit organization. Examines implications of policy-maker choices for implementing institution dynamics and challenges. Junior standing and acceptance into the Washington Semester program required. X-grade allowed. Pre: 3714. (3H,3C) III,IV.

4644H (UAP 4644H): HONORS THE WASHINGTON SEMESTER: POLITICS, POLICY AND ADMIN IN A DEMOCRACY
X-grade allowed. (3H,3C)

4714: SENIOR SEMINAR IN POLICY ANALYSIS
Theoretical, analytical, and methodological approaches used to assess government activities and public policy. Topics vary from semester to semester as announced. Must have senior standing. Pre: 3724, 3734. (3H,3C)

4724: SENIOR SEMINAR IN POLITICAL THEORY
Selected topics in analytic political philosophy, contemporary ideologies, and democratic theory. Topics vary from semester to semester as

announced. Senior standing required. Must have senior standing and any two of the prerequisites. Pre: 3015 or 3016 or 3764 or 3754 or 3774. (3H,3C)

4754: INTERNSHIP PROGRAM
Qualified students are placed in an administrative or legislative staff position under the combined supervision of a faculty member and a responsible supervisor in the employing agency. Detailed reports on the internship experience and a specific project will be required of each intern. (Variable credit to maximum of 6 credits for a full-time position over an entire semester). Three hours of appropriate advanced American government courses, Junior standing, a screening interview, GPA of 3.00 or better and consent required. Variable credit course. X-grade allowed. I,II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

Liberal Arts and Human Sciences

School of Education

http://www.soe.vt.edu/

Susan G. Magliaro, Director
Professors: M. D. Alexander; S. B. Asselin; B. S. Billingsley; P. Burge; J. K. Burton; K. S. Cennamo; E. G. Creamer; T. B. Creighton; J. W. Garrison; J. B. Hirt; B. B. Lockee; S. G. Magliaro; D. J. Parks; K. J. Redican; R. G. Salmon; M. E. Sanders; T. M. Sherman; K. Singh; H. D. Sutphin; T. M. Wildman
Associate Professors: M. A. Barksdale; G. Belli; N. E. Bodenhorn; B. R. Brand; P. E. Brott; N. L. Day-Vines; P. Doolittle; G. E. Glasson; D. Hicks; S. M. Janosik; B. D. Jones; G. F. Lawson; B. F. Lepczyk; P. A. O'Reilly; W. T. Price; G. E. Skaggs; D. L. Stewart; R. K. Stratton; T. W. Twiford; J. G. Wells; J. L. Wilkins; T. O. Williams
Assistant Professors: C. B. Brandt; J. M. Brill; M. Chang; J. F. Eller, III; M. Evans; W. J. Glenn; S. F. Hein; S. B. Kajder; S. F. Lambert; H. A. Mesmer; G. A. Tilley-Lubbs; Y. Miyazaki; K. A. Parkes; V. Pitts Bannister; L. M. Wasserman; L. E. Welfare
Instructor: K. Potter
Clinical Professor: J. R. Craig
Clinical Assistant Professors: C. S. Cash; B. Kreye; A. T. Parlo; N. W. Tripp

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Overview

The School of Education provides professional education programs and degrees only at the graduate level for prospective and experienced teachers, counselors, researchers, and leaders at the elementary, middle, secondary, and post-secondary levels. These programs prepare education professionals for varied employment settings. Special emphasis is placed on science, math, technology, and leadership. Advanced programs are offered at the master's, education specialist, and doctoral levels.

To obtain specific information about these programs and their requirements, interested students should consult the Graduate Catalog or visit the School of Education's website (http://www.soe.vt.edu).

Entrance to the School of Education

Students enter education programs after completing a bachelor's degree with a major in a content field. Content fields vary depending on the teaching, counseling, or administrative license sought or other educational career goal of the student. There is a link to a listing of the appropriate undergraduate majors for teaching licensure in the Office of Academic Programs section of the School of Education website.

Licensure and Employment Opportunities

Students completing professional preparation programs are qualified to receive licenses in Virginia, and these licenses are also accepted in most other states. All degree programs are fully accredited by the National Council for Accreditation of Teacher Education and the Virginia Department of Education.

Graduates of professional preparation programs are well prepared for their initial responsibilities and are actively recruited by school systems across the state. Advisors counsel students early in their programs with respect to post-graduation placement opportunities.

Professional Preparation Programs Offered in the School of Education

The School of Education offers graduate professional preparation programs at both the initial and advanced levels. Please consult the *Graduate Catalog* (http://www.grads.vt.edu) and the School of Education's website (http://www.soe.vt.edu) for admission and graduation requirements.

Undergraduate Courses (EDCI)

2114: PERSPECTIVES IN ELEMENTARY AND MIDDLE SCHOOL EDUCATION
Introduces preservice elementary/middle school teachers to the dynamics of teaching and learning. Focuses on the socioeconomic, political, and academic factors which influence decision making processes. Emphasis is given to future teachers' responsibilities and career opportunities. Clinical experience required. (1H,2L,2C)

2984: SPECIAL STUDY
Variable credit course.

3024: SOCIAL FOUNDATIONS OF EDUCATION
Development, aims, organization, and procedures of public school education. Junior standing required. (2H,2C)

3144 (HD 3144): EDUCATION OF EXCEPTIONAL LEARNERS
Emphasizes legal, ethical, and economic bases, assessment and eligibility requirements, characteristics and educational implications, and practices pertaining to various exceptionalities. (3H,3C)

3154 (PSYC 3154): PSYCHOLOGICAL FOUNDATIONS OF EDUCATION
Emphasizes theories of human learning and the relationship of learning principles to educational practice in general. Within the context of cognitive, social, and behavioral models of learning, attention is given to instructional procedures, student motivation and discipline, and the assessment of educational progress. Junior level standing required. Pre: HD 1004 or PSYC 2004. (3H,3C)

4124 (PSYC 4124): PSYCHOLOGICAL FOUNDATIONS OF EDUCATION FOR PRESERVICE TEACHERS
Emphasizes applying human learning and developmental theories to the classroom setting with a focus on instructional processes and procedures, student motivation, classroom management, and assessment strategies. Participation in a 4-year and 5-year teacher education program and junior level standing required. Pre: PSYC 2004 or HD 1004. (3H,3C)

4174 (PSYC 4174): STUDENTS WITH EMOTIONAL AND BEHAVIORAL DISORDERS
This course examines the characteristics and needs of individuals with emotional and behavioral disorders. Topics include history, definitions and causes of emotional and behavioral disorders, major research findings, identification procedures, educational programming and current issues. (2H,2C)

4414: TEACHING COMPOSITION: METHODS AND MATERIALS
Application of relevant theory and research to instructional strategies for teaching the composing process. Emphasizes methods for generating student writing, teaching revision, and evaluating writing as well as instructional materials. (3H,3C)

4424: LITERATURE FOR ADOLESCENTS
Discussion and analysis of factors involved in selection and use of literature for junior and senior high school students and research related to that selection: reading interests and needs of adolescents, sources of literary materials for adolescents, classroom uses of various types of literature. X-grade allowed. (3H,3C)

4614: INSTRUCTIONAL TECHNOLOGY: AUDIO-VISUAL AND COMPUTER USES
An introductory instructional technology course. Principles and production of audio-visual materials and methods in instruction. Application of microcomputers in instruction, emphasizing computer literacy, programming and evaluation of instructional software. Course in methods of teaching, field teaching experience, or teaching experience required. Pass/Fail only. (2H,3L,3C)

4744: TEACHING IN THE SECONDARY SCHOOL II
Intensive instruction in the methods of teaching in a content area (English, foreign language, mathematics, music, science, or social studies) before and during the student teaching experience. Emphasis on classroom management, effective use of technology, lesson
design and presentation, and long-term planning. Pre: 3724. Co: 4754. (3H,3C)

4754: INTERNSHIP IN EDUCATION
Planned program of clinical practice in education under the direction and supervision of a university supervisor and a selected practitioner. Recommendation of program area and successful completion of Professional Studies requirements required. Variable credit course. X-grade allowed.

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course. X-grade allowed.

Undergraduate Courses (EDPE)

2204: CREATIVE DANCE
Study of the expressive elements of movement and dance and practice designing learning experiences for K-12 students. (3H,3C) I,II.

2254: BALLET
Study of classical ballet technique, vocabulary structures, terminology, and aesthetic values. (1H,3L,2C)

3124: BALLET STUDIO
This course concerns the movement idiom of ballet and is for those students who have mastered the rudiments of ballet technique. It focuses on the refinement of ballet technique, curriculum development, and projects in creative design. Repeated for different content (total 6 credits). I Pre: 2254. (2H,3L,3C)

4314: CONTEMPORARY STUDIO
This course concerns the commonalities and distinctions within movement idioms of contemporary dance. It focuses on differentiating movement style and blending forms, the refinement of dance performance, curriculum development, and projects in creative design. Repeated for different content (total 6 credits). Pre: 3124.
(2H,3L,3C) II.

Undergraduate Courses (EDHL)

1514: PERSONAL HEALTH
Fundamental health content and theory to provide students with constructive health information necessary to meet current and future personal health needs. Special emphasis on wellness and health promotion. (3H,3C) I,II.

2964: FIELD STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3464 (AHRM 3464) (GEOG 3464) (HD 3464) (HUM 3464) (SOC 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. 2000-level course in any cross-listing department required. (2H,3L,3C)

3534: DRUG EDUCATION
Interpretation of multidimensional (social, psychological, and physiological) scientific data regarding drugs. The major drug categories will be covered with special emphasis on substance misuse and abuse. (3H,3C) II.

4754: INTERNSHIP IN HEALTH EDUCATION
Planned program of clinical practice in education under the direction and supervision of a university supervisor and a selected practitioner. Pre: Recommendation of program area and successful completion of Professional Studies requirement. Variable credit course.

4824: MOVEMENT AND DANCE FOR CLASSROOM TEACHERS
This course is designed for future pre-school and elementary classroom teachers. It will focus on gaining an understanding of appropriate movement activities and dance for children. Movement concepts and elements of dance will be introduced and integrated into core subject areas to enhance learning. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Undergraduate Courses (EDTE)

2604: INTRO TO TECHNOLOGY EDUCATION
Introduction to the Technology Education major. Includes introductory experiences in three general areas (production, communication, transportation) and the technological design and problem-solving process. Orientation to professional education, licensure, and issues related to technology education. Co: 3754. (3H,3C)

2964: FIELD STUDY/PRACTICUM
Variable credit course.

2984: SPECIAL STUDY
Variable credit course. X-grade allowed.

3754: EARLY FIELD EXPERIENCE

Participation and observation in a cooperating school district as a teacher aide, tutor, or member of an instructional team. Students will be judged on the basis of the extent to which they meet prescribed competencies. Students will write descriptive reports of activities undertaken and objectives accomplished. (Max 3C) Variable credit course.

4424: CURRICULUM IN TECHNOLOGY EDUCATION
Introduction to the history and development, aims and objectives, and contemporary nature of technology education; develops understanding of selection and organization of subject matter, preparation of resource units, curriculum guides, courses of study, and instructional materials. Senior standing in TED required. (3H,3C) II.

4434: TEACHING METHODS IN TECHNOLOGY EDUCATION
Principles of teaching and learning, techniques and methods of instruction, preparation of teaching units, and practice in presenting technical and non-technical lessons. Senior standing in TED required. (3H,3C)

4754 (ALS 4754): INTERNSHIP IN EDUCATION
Planned program of clinical practice in education under the direction and supervision of a university supervisor and a selected practitioner. Recommendation of program area and successful completion of Professional Studies required. Variable credit course. X-grade allowed.

4964: FIELD STUDY/PRACTICUM
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4984: SPECIAL STUDY
Variable credit course.

Undergraduate Courses (EDCT)

3754: EARLY FIELD EXPERIENCE
Participation and observation in a cooperating school district as a teacher aide, tutor, or member of an instructional team. Students will be judged on the basis of the extent to which they meet prescribed competencies. Students will write descriptive reports of activities undertaken and objectives accomplished. Variable credit course. Co: 2604.

4204: MANAGING CAREER AND TECHNICAL EDUCATION WORK-BASED PROGRAMS
Responsibilities of the teacher coordinator regarding work-based program standards, student guidance, school and community relations, on-the-job training, youth organization sponsorship, work-based program coordination, and program management. Pre: 2604, (4274 or 4964). (3H,3C)

4234: CURRICULUM FOR CAREER AND TECHNICAL EDUCATION
Provides current and prospective career and technical education teachers with research bases, resources, and available curricula for teaching content in the respective fields. Develops the ability to plan, manage, develop, and evaluate curricula. Pre: 2604 or 5604. (3H,3C)

4254: ADULT CAREER AND TECHNICAL EDUCATION PROGRAMS
Introduction to the underlying theory and procedures involved in developing, delivering, managing, and evaluating adult education programs in Career and Technical Education. Co: 4244. (3H,3C)

4274: INTERNSHIP IN BUSINESS
While employed in a business occupation, the student completes an in depth study of the firm's policies, practices, and procedures. This study, conducted under the supervision of the employer and a Career and Technical Education professor, focuses on five major aspects of the business: sales promotion, merchandising, business operation, control, and personnel. (Max 5H,5C) Variable credit course. X-grade allowed. Pre: 2604.

4604: FUNDAMENTALS OF TRAINING AND DEVELOPMENT
Overview of training and development in an organizational setting. Students learn the relationship of training and development to human resource development and selected skills necessary to successfully become a training specialist. Particular attention is given to the design and implementation of training and development programs. X-grade allowed.
3H,3C)

4614: INSTRUCTIONAL APPLICATIONS IN TRAINING AND DEVELOPMENT
Develop the ability to plan, organize and apply a variety of group and individual instructional methods in an organizational setting. Emphasis is placed on methods and procedures used by successful training specialists. X-grade allowed. (3H,3C)

4754: INTERNSHIP IN EDUCATION
Planned program of clinical practice in education under the direction and supervision of a university supervisor and a selected practitioner. Pre: Recommendation of program area and successful completion of Professional Studies requirement. Variable credit course. X-grade allowed.

4964: FIELD STUDY/PRACTICUM
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH

Variable credit course.

Liberal Arts and Human Sciences Programs of Study

Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Science and Technology in Society

www.sts.vt.edu/

Ellsworth R. Fuhrman, Head
Alumni Distinguished Professor: G. L. Downey
Professor: D. T. Zallen
Associate Professors: B. L. Allen; D. Breslau; E. Crist; S. E. Halfon; A. F. LaBerge
Assistant Professors: J. E. Abbate; S. Schmid; M. Wisnioski
Visiting Assistant Professor: B. J. Reeves
Emeritus Professor: R. M. Burian
Undergraduate Coordinator: Crystal Harrell

Overview

The Department of Science and Technology in Society (STS) offers interdisciplinary work at both the undergraduate and graduate levels that contributes to our understanding of the relations among science, technology, and society. At the undergraduate level, it offers one major and five minors or programs of study.

Humanities, Science, and Environment Major and Minor (HSE)

The degree program in Humanities, Science, and Environment (HSE) provides an interdisciplinary approach to environmental issues, integrating humanities, social sciences, and natural sciences to understand the relationship between people and the natural world. HSE also offers a 27 semester hour minor. For more information or a checksheet, please contact Prof. Eileen Crist (ecrist@vt.edu). HSE Major Checksheet: http://www.sts.vt.edu/documents/HSE2011.pdf; HSE Minor Checksheet: http://www.sts.vt.edu/HST/HSEminor.pdf.

General Information:

Other departmental minors require 18-21 semester hours, 9 of which must be at the 3000 and 4000 levels. STS also offers a degree option in Science and Technology in Society under the IDST major.

The two main themes in STS courses are: (a) the human and social dimensions of science and technology; and (b) the historical, societal, and value issues pertaining to the biological sciences, physical sciences, engineering, and technology. Most STS courses qualify for credit in Area 2 of Liberal Education; a few are in Area 3 or Area 7. The 1000-level course examines how contemporary values influence developments in science and technology and, in turn, how science and technology help shape our values and influence the society in which we live. Courses at the 2000 level survey issues pertaining to a particular area of the sciences or engineering. Courses at the 3000

level focus on conceptual issues, examining formative ideas and cultural traditions, identifying the historical trajectories that brought these into existence, and enabling students to imagine and critically assess alternative futures. Finally, courses at the 4000 level explore the value dimensions of a specific topic, such as environmental science, health care, science and pseudo-science, and computerization.

Humanities, Science, and Technology Minor (HST)

This minor may be designed to emphasize combinations of moral, aesthetic, intellectual, political, historical, philosophical, and sociological dimensions of science, technology, and medicine, through case studies and in-depth analysis. Students work with the undergraduate coordinator in STS to design a coherent program. HST Minor Checksheet: http://www.sts.vt.edu/HST/HSTminor.pdf

Two introductory courses are required from the following list (6 cr hrs):	
STS 1504:	Introduction to Humanities, Science and Technology
STS/HIST 2054:	Engineering Cultures
STS 2154:	Humanities, Technology, and the Life Sciences
STS 2354:	Humanities, Technology, and the Physical Sciences
STS 3105:	Science and Technology in Modern Society
The remaining 12 cr hrs needed to complete the minor must be drawn from the following STS and related courses:	
STS 1504:	Introduction to Humanities, Science and Technology
STS/HIST 2054:	Engineering Cultures
STS 2154:	Humanities, Technology, and the Life Sciences
STS 2354:	Humanities, Technology, and the Physical Sciences
STS/REL/AAEC 2464:	Religion and Science
STS 3105:	Science and Technology in Modern Society
STS 3314:	Medical Dilemmas and Human Experience
STS/WS 3324:	Perspectives on the Biology of Women*
STS/HIST 3705:	History of Science I
STS/HIST 3706:	History of Science II
STS/HIST 3715:	History of Technology I
STS/HIST 3716:	History of Technology II
STS 4304:	Contemporary Issues in Humanities, Science, and Technology
STS 4504:	Science, the Scientist, and Society
STS/WS 4704:	Gender and Science*
STS 4754:	Internship
STS 4964:	Field Study
STS 4974:	Independent Study
STS 4984:	Special Study
STS 4994:	Undergraduate Research
GEOG 4074:	Medical Geography*
HIST 3144:	American Environmental History
HIST 3724:	History of Disease, Medicine, and Health
HIST 4214:	Topics in the History of Science, Medicine, and Technology*
PHIL 2605:	Reason in Science
PHIL 2606:	Revolution in Science
PHIL 4604:	Philosophy of Biology*
PHIL 4614:	Philosophy of Science*
SOC 4804:	Sociology of Science*

*These courses have a prerequisite.

Science and Technology Concentration (ST)

This individualized concentration requires in-depth study and practice of theories and methods of science and technology. Students choose a concentration in one science or technology program; coupled with 9 credit hours of STS courses; the student's program of study must be approved by the STS undergraduate coordinator. In some fields, more than 18 credit hours may be required to complete the concentration.

Medicine and Society Minor (MSOC)

This minor offers the opportunity to develop a humanistically and culturally sensitive understanding of how people experience illness and interact with health professionals – an excellent background for those considering a career in medicine or other health sciences, and essential for everyone who is a consumer of modern health care. The minor requires 21 credit hours. Programs of study must be approved by the minor coordinator; for information, please see http://filebox.vt.edu/users/bhausman/msoc/about.htm. MSOC Minor Checksheet: http://www.sts.vt.edu/HST/MSOCchecksheet.pdf

The following courses are required (12 cr hrs):	
ENGL 3154:	Literature, Medicine, and Culture*
HIST 3724:	History of Disease, Medicine, and Health
SOC 4704: or GEOG 4074: or SOC 3714: or SOC 4414: or SOC 4714	Medical Sociology* or Medical Geography or Sociology of Aging or Drugs and Society or Sociology of Mental Illness
STS 3314: or UH 3004:	Medical Dilemmas and Human Experience or Biomedical Ethics
The remaining 9 cr hrs must be selected from the following approved list:	
BIOL 3504H: (2 hrs) and UH 2984 (1 hr)	Hospital Preceptorship and Careers in Medicine
ENGL 3534:	Literature and Ecology*
GEOG 4074:	Medical Geography*
HD 1004:	Human Development in Childhood and Adolescence
HD 2314:	Human Sexuality
HD 3114:	Issues in Aging
HD 3314:	Human Sexuality
HD 4324:	Family Risk and Resilience
HIST/STS 3705, 3706:	History of Science I, II
HIST 4214:	Topics in the History of Science, Technology and Medicine*
HUM/COMM 3204:	Multicultural Communication
PHIL 1304:	Morality and Justice
PHIL 3314:	Ethical Theory*
PHIL 4604:	Philosophy of Biology*
PSYC 3054:	Health Psychology*
REL 1044:	Religious Ethics
SOC 3714:	Sociology of Aging*
SOC 4414:	Drugs and Society*
SOC 4714:	Sociology of Mental Illness*
SOC 4724:	Sociology of Death*
STS 2154:	Humanities, Technology, and the Life Sciences
STS 3105:	Science and Technology in Modern Society
STS 4304:	Contemporary Issues in Humanities, Science, and Technology
STS 4754:	Internship
STS 4994:	Undergraduate Research
UAP 4614	Health Policy*

WS 2244:	Women and Science*
WS/STS 3324:	Perspectives on the Biology of Women*
WS/STS 4704:	Gender and Science*

* These courses have a prerequisite.

Gender, Science, and Technology Minor (GST)

Co-developed by Women's Studies and STS, this minor offers the opportunity for students to cultivate an understanding of the complex ways in which gender is defined in relation to science and technology, and science and technology are defined in relation to gender. The minor coordinator is the Director of the Women's Studies Program.

The following courses are required (12 cr hrs):	
WS 1824:	Introduction to Women's Studies
STS 1504:	Introduction to Humanities, Science and Technology
WS 2244:	Women and Science*
WS/STS 4704:	Gender and Science*
At least 6 cr hrs must be chosen from the following list of approved electives:	
WS 3004:	Topics in Feminism* (if on science and/or technology)
WS 3324:	Perspectives on the Biology of Women*
WS 3984:	Special Study*
WS 4224:	Women's Studies Seminar* (if the topic concerns science and/or technology)
WS 4754	Internship* (3 cr hrs maximum)
WS 4974:	Independent Study (3 cr hrs maximum)
WS 4984:	Special Study (if on science and/or technology)
STS 4304:	Contemporary Issues in Humanities, Science, and Technology (when on gender or inequality)
UAP 4214:	Women, Environment, and Development in a Global Perspective*

* These courses have a prerequisite.

Graduate Program

STS jointly administers the Science and Technology Studies Graduate Program with the departments of History, Philosophy, Political Science, and Sociology. The program offers the M.S. and Ph.D. degrees at both the Blacksburg and National Capital Region campuses. (See the Graduate Catalog for further information.)

Note: All courses previously taught as HST are now STS.

Undergraduate Courses Descriptions (STS)

1504: INTRODUCTION TO HUMANITIES, SCIENCE, AND TECHNOLOGY An introduction to ways of considering interrelationships among three of the major dimensions of our culture: its science, its technology, and its humanistic orientation. (3H,3C)

2054 (HIST 2054): ENGINEERING CULTURES
Development of engineering and its cultural roles in historical and cross-national perspectives. Explores roles of engineers and engineering in popular life, development of national styles, changing values in engineering problem solving, and effects of evolving forms of capitalism. (3H,3C)

2154: HUMANITIES, TECHNOLOGY, AND THE LIFE SCIENCES
Examines the value-laden issues surrounding the professional dimensions of research in the biological and life sciences and provides humanistic perspectives on the role and function of science in society. (3H,3C)

2354: HUMANITIES, TECHNOLOGY, AND THE PHYSICAL SCIENCES
Examines the value-laden issues surrounding the professional dimensions of research in the physical sciences and technology, and provides humanistic perspectives on the role and function of science in society. (3H,3C)

2464 (AAEC 2464) (REL 2464): RELIGION AND SCIENCE
Exploration of the relationships between religion and science in the western tradition. Topics include: basic frameworks for relationships between religion and science in historical and cultural context; types of human knowledge and truth; similarities and differences between science and religion; evolution; ecology; and contemporary issues. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3105,3106: SCIENCE AND TECHNOLOGY IN MODERN SOCIETY
Examination of science and technology as social and cultural activities in the modern world. 3105: institutions and values in science and technology; 3106: value conflicts and decision making in science and technology. (3H,3C)

3314: MEDICAL DILEMMAS AND HUMAN EXPERIENCE
This course will explore medical dilemmas from a humanistic perspective, including topics related to assisted reproduction, genetic testing and treatment, organ transplantation, clinical trials, end-of-life interventions, and decisions regarding allocation of health-care resources. (3H,3C)

3324 (WS 3324): PERSPECTIVES ON THE BIOLOGY OF WOMEN
Examines historical, social, and cultural views of women's biology and how those views have impacted women's physical and mental health. Special attention is paid to the influence of cultural traditions and beliefs on scientific perspectives. Pre: WS 1824. (3H,3C)

3705,3706 (HIST 3705, 3706): HISTORY OF SCIENCE
Conceptual and institutional development of physical and biological sciences viewed within a cultural and societal context. 3705: Early Science; 3706: Modern Science (3H,3C)

3715,3716 (HIST 3715, 3716): HISTORY OF TECHNOLOGY
Description of the development of technology and engineering in their social contexts. 3715: from prehistory to the industrial revolution in Europe and the United States, mid-19 century; 3716: from mid-19th century to the present. (3H,3C)

3734 (HIST 3734): HISTORY OF MODERN BIOLOGY
This course explores the development of biology from the Enlightenment to the end of the twentieth century, with a particular emphasis on biology's impact on society. (3H,3C)

3984: SPECIAL STUDY
Variable credit course.

4304: CONTEMPORARY ISSUES IN HUMANITIES, SCIENCE, AND TECHNOLOGY
Contemporary humanistic issues, such as human freedom and the quality of life, emerging from scientific and technological research in the areas of genetic and reproductive interventions, biotechnology, and environmental studies. Junior standing is required. (3H,3C)

4504: SCIENCE, THE SCIENTIST, AND SOCIETY
The intellectual climate, social environment, and personal motivations that affected a noteworthy scientist during his or her research career, for example, Darwin, Curie, Freud, and Einstein. (3H,3C)

4704 (WS 4704): GENDER AND SCIENCE
Investigates the gender dimensions of science in both historical and contemporary perspectives. Discusses feminist studies of science, exploring strengths and limitations. Assess implications of cultural assumptions about gender for practicing scientists. A 3000 level course in science or engineering may satisfy the prerequisite. Pre: 1504 or WS 2244. (3H,3C)

4754: INTERNSHIP
Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Liberal Arts and Human Sciences

Sociology

www.sociology.vt.edu

John Ryan, Chair
Distinguished Professor: W. E. Snizek
Professors: B. Agozino; T. M. Calasanti; E. R. Fuhrman; T. D. Fuller; J. Hawdon; M. Hughes; J. Ryan; W. Reed; D. J. Shoemaker, B. E. Smith
Associate Professors: C. A. Bailey; C. Burger, L. Gillman, K.J. Kiecolt; N. King, D. W. Wimberley
Assistant Professors: K. Harrison; M. Kim, P. Polanah; P. Seniors; A. Vogt Yuan
Adjunct Professors: R. Blieszner; D. Breslau; G. L. Downey; N. M. King; N. McGehee; P. D. Metz; K. Moore; J. M. Shepard
Advanced Instructor: E.T. Graves
Instructor, Career Advisor: D. Sedgwick
Emeritus Professors: J. A. Ballweg; A. Bayer; C. D. Bryant; C. J. Dudley; J. N. Edwards; B. R. Hertel; J. W. Michaels
Career Advisor: Donna Sedgwick, 231-8965
Affiliates (Professors): K. Allen (Human Development); R. Blieszner (Human Development); C. Burch-Brown (Art); E. Creamer (Educational Leadership and Policy Studies); K. DePauw (Graduate School, Sociology, Human Nutrition, Foods, and Exercise); G. Downey (Science and Technology in Society); E. Fine (Interdisciplinary Studies); V. Fowler (English); B. Hausman (English); A. Kilkelly (Theater Arts); Ilja Luciak (Political Science); P. Meszaros (Human Development); J. Rothschild (Government and International Affairs); L. Roy (English); S. Rowlands (CLAHS); K. Singh (Education); D. Stoudt (CLAHS)
Affiliates (Associate Professors): K. Belanger (English); C. Dannenberg (English); W. Dunaway (Government and International Affairs); E. Ewing (History); S. Fowler (Graduate Education Development Initiative, English); S. Johnson (Foreign Languages and Literatures); K. Jones (History); S. Knapp (English); M. Mollin (History); K. Powell (English); R. Shingles (Political Science); D. Tatar (Computer Science); J. Watson (Foreign Languages and Literatures); Y. White (Art and Art History)
Affiliates (Assistant Professors): C. Brandt (Teaching and Learning); S. Carter-Tod (English); S. Halfon (Science and Technology in Society); P. Hoon (Politicial Science); C. Kaestle (Human Development); S. Paterson (Art and Art History); E. Satterwhite (Interdisciplinary Studies); R. Scott (Interdisciplinary Studies); B. Shadle (History)
Affiliates (Instructors): L. Pendleton (Electrical and Computer Engineering); S. Samanta (Interdisciplinary Studies and Sociology)
Affiliates (Adjunct Faculty): E. Chancey (Interdisciplinary Studies); M. E. Christie (Women in International Development); J. Henderson (Interdisciplinary Studies); M. James-Deramo (Service Learning)

Overview

The department offers programs leading to the B.S., M.S., and Ph.D. and provides courses open to students in all colleges of the university. Undergraduate majors are required to complete the Curriculum for Liberal Education and the core curriculum of the College of Liberal Arts and Human Sciences, 31 hours in sociology, plus STAT 3604, 6 hours from another social science department and 6 hours of approved additional transferable skills. Required courses are: SOC 1004, 3004, 3104, 3204 and 4194. In addition students must take a minimum of 15 hours of sociology electives, no more than six hours of which can be taken at the 1000-20000 level. Of the remaining nine hours in sociology, a minimum of six hours must be taken at the 4000 level.

By the time a student has completed his/her 72nd semester credit, he/she should have completed at least: Soc 1004, STAT 3604 and 15 additional hours in Sociology, with no more than 9 hours at the 1000-2000 level and at least 3 hours at the 4000 level.

Three specialities are also offered: crime/deviance, social inequality, and workplace relations. Each of these has its own set of additional course requirements. Please request additional information and course lists from the departmental office.

For a minor in sociology, the undergraduate student is required to complete 18 hours in sociology including SOC 1004. No more than nine hours at the 1000-2000 level shall count toward the 18-hour requirement for a minor. A minimum GPA of 2.0 for courses in the minor is required.

The Cooperative Education Program is available to qualified undergraduates in the curriculum. Information on the program may be found elsewhere in this catalog.

The department offers an internship program for eligible majors.

The department also cooperates with curricula offerings through the Appalachian Studies program, the Africana Studies program, the Center for Gerontology, the Center for the Study of Science in Society, and the Women's Studies program.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics"), toward the Liberal Arts and Human Sciences Core, and toward the degree in sociology.

Satisfactory progress toward the B.S. in sociology requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

SOC 1004: Introduction to Sociology	3
Sociology	9
STAT 3604: Statistics for Social Sciences	3
Total Credits	**(15)**

1. Upon having attempted 60 semester credits, students must have an in-major grade point average of 2.0 or above.

Africana Studies Program

Onwubiko Agozino, Director

Professors: B. Agozino (Africana Studies); W. Reed (Africana Studies)
Gloria Smith Endowed Professor: F. D'Aguiar (English)
Assistant Professors: K. Harrison (Africana Studies and Sociology); P. Polanah (Africana Studies); P. Seniors (Africana Studies)
Instructors: E. McPherson (Educational Technologies)
Affiliated Faculty: N. Giovanni (English); R. Graham (Art); L. Roy (English); V. Fowler (English); H. Farrar (History); B. Bunch-Lyons (History); E. Graves (Sociology); M. Herndon (Interdisciplinary Studies)

Africana Studies is an interdisciplinary field of study that uses concepts and methodologies of the Social Sciences and the Humanities, centering on the study of peoples of African descent. The program cooperates with faculty from across the university, whose teaching and research is concerned with Africa and the African diaspora. Africana Studies supports the university's objective to increase the numbers of students and faculty of color. It also engages with other programs and organizations in community awareness activities that celebrate the richness and diversity of African diasporic cultures and traditions.

The Africana Studies program presently offers two minors. One focuses on African Americans while the other focuses on continental Africa. We also offer an Africana Studies IDST major degree option. The African American Studies minor requires successful completion of at least 18 semester hours from the following:

REQUIRED COURSES	
AFST 1714	Introduction to African American Studies
AFST 4354	Issues in Africana Studies
Electives: **Choose 12 credits from the list below of which at least 6 credits must be at the 3000 level or above.**	
AFST/IDST 1814	Intro to African Studies
AFST/REL 2144	African Religions
AFST 2354	The Civil Rights Movement

AFST 2454	Race and Racism
AFST/REL 2734	The Black Woman in the USA
AFST/REL 2744	The Black Church in America
AFST 2754	Sports and The Afro-American Experience
AFST 2774	Black Aesthetics
AFST/HIST 3175	Afro-American History
AFST/HIST 3176	Afro-American History
AFST 3454	African American Leadership
AFST/ENGL 3634	African American Literature
The African Studies minor requires successful completion of at least 18 semester hours from the following:	
Required Courses	
AFST/IDST 1814	Intro to African Studies
AFST 4354	Issues in Africana Studies
Electives: **Choose 12 credits from the list below of which at least 6 credits must be at the 3000 level or above.**	
HIST 2304	Africa in the Modern World
AFST/REL 2144	African Religions
AFST 2774	Black Aesthetics
AFST/HIST 3175	Afro-American History
AFST/HIST 3176	Afro-American History

Successful completion of the requirements for the two minors and the core courses in Interdisciplinary Studies (IDST) allows a student to receive a BA in Interdisciplinary Studies (IDST) with an option in Africana Studies.

American Indian Studies: A Holistic Approach

A program in the Department of Sociology, we offer several courses and a minor in American Indian Studies.

We believe that any successful American Indian Studies program must do more than simply educate a general student body on American Indian cultures and issues in a sensitive way. We believe that our curricula must exist in conjunction with all university programs pertinent to American Indians, and must depend on the impetus of indigenous peoples working within and beyond the university.

In keeping with Virginia Tech's status and mission as a land grant institution, we strive to serve our indigenous constituency, both as educators and as partners. Accordingly, our program serves as a vital conduit for university-tribal relations, the recruitment and retention of American Indian students and faculty, and Service-Learning initiatives in indigenous communities. Although our program has a regional focus, we offer a wide spectrum of courses--ranging from American Indian Literatures, American Indian Spirituality, and American Indian Arts, to native Peoples of the Southeast, American Indians in Film, and Global indigenous Rights--reflecting the impressive and diverse expertise of our faculty.

In short, we embrace a holistic, collaborative approach to American Indian Studies in which university faculty and students develop and maintain meaningful partnerships. Accordingly, we maintain a tribal advisory board consisting of elders and leaders from all of Virginia's eight Indian Nations. We regard these representatives, and ultimately, all indigenous peoples as our colleagues.

Women's and Gender Studies

The field of Women's and Gender Studies (WGS) transforms traditional disciplines through new methods and theories generated by feminist scholarship. The Women's and Gender Studies Program is housed in the Department of Sociology and includes teaching faculty and affiliates from across the entire campus. WGS affiliated faculty contribute to the program through their research, student advising, participation in governance, and teaching.

Women's and Gender Studies offers courses for all students in the university, including four in Area 2 of the Curriculum for Liberal Education (WS 1824, WS 2224, WS 2234, and WS 2254), one in Area 3 (WS 2264), and two in Area 7 (WS 2234 and WS 3214). Students interested in WGS may select from a degree option in Interdisciplinary Studies (the equivalent of a major), and two minors: Women's and Gender Studies, and Gender, Science, and Technology. The degree option and minors are interdisciplinary, cross-cultural programs of study in which students cultivate an understanding of the complex ways that gender is defined and contested in social structures, history, culture, and technology. They offer students new ways of thinking about how gender, race/ethnicity, class, and sexuality shape social institutions and cultural beliefs as well as personal experiences and perceptions. Central to the mission of the Women's and Gender Studies Program is the empowerment of a diverse population of women within local, regional, national, and global contexts.

A graduate certificate in Women’s and Gender Studies is also available. See the Graduate Catalog.

The degree option in Women's and Gender Studies requires 30 hours of course work, at least 15 hours of which must be at the upper division (3000-4000) level. Four courses are required, including WS 1824, WS 2114, WS 2254 and WS 4224, which are ideally taken in sequence. Numerous approved electives within WGS and related fields are offered. Minors in Women's and Gender Studies and in Gender, Science and Technology (GST) require 18 semester hours of course work in WGS and related fields. Nine hours of preparatory course work at the 1000 and 2000 levels, including WS 1824 and WS 2214, are required for the Women's and Gender Studies minor. Students minoring in WGS must also take WS 4224, and those in GST must take WS 4704. For both minors, students also complete six additional hours of more advanced course work at the 3000 level or above, with more choice and flexibility at the upper level. Students pursuing the degree option must complete at least six hours of course work explicitly focused on multiple forms of inequality; for minors, a three-hour course with a focus on gender and race is required. Students must achieve a GPA of 2.0 or better in all the courses used to satisfy the degree option or the minors. Students pursuing these degrees should see the Women's and Gender Studies Director to enroll. Please refer to the Women's and Gender Studies web site at www.wgs.clahs.vt.edu/ for specific requirements.

TOP

Undergraduate Course Descriptions (AFST)

1714: INTRODUCTION TO AFRICAN AMERICAN STUDIES
Introduction to the interdisciplinary field of Africana Studies. Organized around central themes and forces that have shaped and been shaped by the life experience of people of African descent. (3H,3C)

1814 (IDST 1814): INTRO TO AFRICAN STUDIES
Introduces students to the study of sub-Saharan Africa -- history, politics, economics, arts, and culture -- and to Africa's place in the world. Required first course in the African (Area) Studies concentration. (3H,3C)

2144 (REL 2144): AFRICAN RELIGIONS
The role of religious (or belief) systems in African society, especially the three predominantly religious traditions in Africa: the so-called African traditional religions, Islam, and Christianity; the universe of religious systems and religious experiences and processes of Africa, in particular Sub-Saharan Africa; critical examination of the mythic stature of Africa's "religions" within Western cultural (and scholarly) world views and institutions. (3H,3C)

2354: THE CIVIL RIGHTS MOVEMENT
Examines the Civil Rights Movement in the U.S. Both non-violent and violent resistance will be examined, as well as strategies used in organizing mass boycotts, sit-ins, and marches. Special attention will be paid to how the movement shaped civil rights legislation on the federal level. The course also examines how the Movement influenced student protest on college campuses. (3H,3C)

2454: RACE AND RACISM
Examines theories of race and racism specifically as they relate to African Americans. We will explain conservative, neo-conservative, liberal, and progressive ideologies concerning race in past and recent United States contexts and how such theories emerged and continue to emerge in recent times. Though the majority of the course focuses on race and racism within the U.S., comparative analyses will be made with Brazil and South Africa. (3H,3C)

2734 (REL 2734) (WS 2734): THE BLACK WOMAN IN THE U.S.
The emerging womanist perspective of "interstructured oppression," (i.e., the simultaneous effects of racism, sexism, and classism) as relevant to the contributions of Black women in the U.S.; views of Black women from African backgrounds, the Atlantic slave trade, and the progressive rise of womanist/feminist liberation movements in Black culture; contributions of Black women in the U.S. and globally. (3H,3C)

2744 (REL 2744): THE BLACK CHURCH IN AMERICA
An inspection of the history and culture of the Black American Church. The course focuses upon the African origin and African-American development of religions and sects. The course will emphasize broad themes, historical patterns, and similarities as well as differences in the Afrocentric and Eurocentric methods of worshipping. (3H,3C)

2754: SPORTS AND THE AFRO-AMERICAN EXPERIENCE
Sports as a paradigm of the African-American experience. The forms of racism and the periodic significant social advances of the African-American community in the U.S. will be examined from the vantage point of African-American sports. Attention will also be paid to the continuing impact of sports on African-American culture. Sports heroes, successful teams and annual sporting events will be noted and analyzed. (3H,3C)

2774: BLACK AESTHETICS
A definition of those qualities of black American arts which distinguish it from traditional U.S. arts through an analysis of theme, form, and technique as they appear in a representative sample of works by black creative artists. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3174 (HIST 3174): AFRICAN AMERICAN MEN IN UNITED STATES HISTORY
Chronological and thematic examination of significant historical moments in black men's lives. Examination of the social, cultural, and political forces contributing to a uniquely African American male experience in the United States. Survey of events in America's collective past such as wars, depressions, and protest movements. (3H,3C)

3175,3176 (HIST 3175, 3176): AFRO-AMERICAN HISTORY
The Afro-American experience in the United States from 1619 to the present. Emphasis upon slavery and the strategies of economic and social survival in the twentieth century. 3175: 1619-1877 3176: 1877-present (3H,3C)

3454: AFRICAN AMERICAN LEADERSHIP FOR SOCIAL CHANGE
This course will utilize the three major paradigmatic assumptions in Black Studies (centeredness, critical analysis, and empowerment) to examine historical and contemporary African American leadership concepts and styles and their impact on social change. (3H,3C)

3634 (ENGL 3634): AFRICAN AMERICAN LITERATURE
Afro-American writings from Phyllis Wheatley through the slave narratives of the nineteenth century to such modern figures as Wright, Hughes, Baldwin, and Morrison. (3H,3C)

3984: SPECIAL STUDY
Variable credit course.

4354: ISSUES IN AFRICANA STUDIES
A variable topics course in which students will use the Africana Studies paradigm to take a centered, critical, and empowering look at various topics regarding people of African descent. (3H,3C)

4704: HISTORY OF AFRICAN-AMERICAN THEATRE
An in-depth study of Black Theatre in America. It will explore the history and development of Black Theatre – both commercial and non-commercial. The course will also stimulate critical thinking pertaining to racial issues, differences in aesthetics and cultures. Pre: 1715. (3H,3C)

4754: INTERNSHIP
Variable credit course.

4774: BLACKS IN THE PERFORMING ARTS
An examination of the performing arts as a paradigm of the African-American experience. Forms of U.S. racism and the periodic significant social advances of the U.S.'s African-American community will be examined in this course from the vantage points of blacks in theatre, film, dance, and music. Emphasis will be placed on the continuing impact of performing arts on African-American culture. Performers, heroes, historical works and performing arts events will be analyzed. Pre: 1714. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

Undergraduate Course Descriptions (AINS)

1104 (HUM 1104): INTRODUCTION TO AMERICAN INDIAN STUDIES
Introduces students to the richness and complexity of American Indian societies past and present. The course begins by considering the critical question of what it means to be "American Indian" or "Native American," comparing externally produced stereotypes with a wide variety of indigenous discourses and narratives. Through a special focus on specific indigenous groups and regions, the course examines American Indian experiences with and reactions to colonial confrontations, government policies, and cultural interchanges with non-Indians.
(3H,3C)

2104 (COMM 2104) (HUM 2104): ORAL TRADITIONS AND CULTURE
Examination of the world's great oral traditions, both ancient and contemporary. Emphasis on performance contexts, relationships among multicultural traditions, including American Indian oral traditions, and the relationships among orality, literacy, technology, media, and culture. I (3H,3C)

2804 (ENGL 2804): CONTEMPORARY NATIVE AMERICAN LITERATURES
This course offers a sampling of fiction, poetry, and non-fiction by the most influential American Indian writers since 1970, authors such as Momaday, Silko, Deloria, Welch, Harjo, and Alexie. Students will also learn about those aspects of cosmology and storytelling traditionally shared by all American Indian Nations, as well as about those aspects specific to the individual tribal traditions from which the authors and their characters come. Pre: ENGL 1106 or ENGL H1204 or COMM 1016. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

3304 (ENGL 3304): THE LANGUAGES OF NATIVE AMERICA
Study of the structures of the native languages of the Americas; their interrelationships; their use in individual speech communities; contact with other languages; the interrelationships of linguistic structure, culture, and thought; their future survival. Pre: ENGL 1106 or ENGL H1204 or COMM 1016. (3H,3C)

3684 (PSCI 3684): INDIGENOUS PEOPLES AND WORLD POLITICS
A survey of the historical and contemporary struggles of indigenous peoples throughout the world. Examines the dynamics of colonialism (internal and external), identity construction, gender, cultural integrity, and the ongoing global indigenous rights discourse. In addition to covering broad global processes/theoretical approaches, comparative case studies of particular indigenous groups, such as the Maasai (Kenya, Tanzania) and Mayans

(Mexico, Guatemala, Belize), are used to highlight the global, regional, and intra-community diversity among contemporary indigenous peoples. (3H,3C)

4004 (HUM 4004): TOPICS IN AMERICAN INDIAN STUDIES
A variable topics course in which students will engage an interdisciplinary methodology to pursue a critical and in-depth examination of various topics concerning and pertinent to American indigenous peoples. This course is repeatable for up to 6 hours credit with different topics. Must meet prerequisite or have permission of the instructor. Pre: 1104. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

TOP

Undergraduate Course Descriptions (SOC)

1004: INTRODUCTORY SOCIOLOGY
Social bases of human behavior, including an introduction to basic theories, research methods, social institutions, complex organizations, and human groups. Social and social psychological antecedents for politics, family, work, science, education, and religion. (3H,3C) I,II,III,IV.

1014: INTRODUCTION TO SOCIAL ANTHROPOLOGY
Introduction to basic concepts in social anthropology related to the study of the evolution, social organization, and major institutions of traditional societies with emphasis on non-western cultures. (3H,3C) II.

2004: SOCIAL ORGANIZATION AND SOCIAL PROBLEMS
Major social problems in contemporary American society, including those associated with aging, crime, family life, urban life, environmental issues, religion, politics, and work. (3H,3C) I,II.

2014: DATING, MARRIAGE AND DIVORCE
Description and analysis of dating and marital relationships in contemporary society, with additional attention given to factors associated with divorce. (3H,3C) I,II.

2024: MINORITY GROUP RELATIONS
Reasons for existence of minority groups and consequences of being subordinate. Focus on racial, ethnic, gender, and age differences. Employment, family relations, health, and general quality of life. Includes cross-national comparisons. Core Curriculum approved for Area II only when taken only in combination with AFST 1714. (3H,3C) I,II.

2304: INDIVIDUAL IN SOCIETY
Development of the self through social interaction. Factors affecting individual and collective perceptions, attitudes, and behavior in social contexts. (3H,3C) I,II.

2404: DEVIANT BEHAVIOR
Behavior considered deviant in contemporary society, including serious crimes by individuals and organizations, sexual deviance, violence, suicide, alcoholism and other drug addiction, and mental illness. (3H,3C) I,II.

2504: COMPARATIVE SOCIAL CHANGE
Patterns and processes of social and cultural changes in developing areas of the world. Attention to ideologies of change and the transformation of major social structures within societies. (3H,3C) II.

2514: APPALACHIAN SOCIAL ISSUES
Survey of social issues of Appalachia including the emergence and perpetuation of stereotypical images, the impact of the coal industry on the social environment, and consideration of religious, political, and social policy aspects. (3H,3C) II.

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: SOCIAL INEQUALITY
Class, status, and power in society. Theories and empirical research findings on vertical and horizontal stratification in society. Class differences in behavior, values, and avenues and extent of social mobility. Cross cultural comparisons. Pre: 1004. (3H,3C) II.

3014: GENDER RELATIONS
Examination of gender relations and roles in the United States and cross-culturally, including a focus on sexual patterns. Explanations of these patterns and their relationship to major social institutions are covered. Pre: 1004. (3H,3C) II.

3104: SOCIOLOGICAL THEORY

Focus on the development and contemporary state of sociological theory. Primary concern is with those theorists who have had significant impact on our thinking about the relationships among man, society, and nature. Pre: 1004. (3H,3C) I,II.

3204: SOCIAL RESEARCH METHODS
Techniques of data collection and analysis employed in the social sciences with emphasis on survey research methods including questionnaire construction, sampling, and analysis of both self-collected and national data; logic behind application of these techniques. Pre: STAT 3604. (4H,4C)

3304: COLLECTIVE ACTION
How people organize to influence institutional arrangements in society. Panic behavior, riots, protest movements, strikes, coalitions, and revolutions. Theories and issues related to collective action. I Pre: 1004. (3H,3C)

3414: CRIMINOLOGY
Principles of criminology and contemporary theories of criminal behavior, focusing on the extent and distribution of crime in the United States. Pre: 1004. (3H,3C) I,II.

3424: JUVENILE DELINQUENCY
Examination of juvenile delinquency in the United States including theories and explanations of delinquency, the juvenile justice system, and treatment and prevention of delinquency. Pre: 1004. (3H,3C) I,II.

3464 (AHRM 3464) (EDHL 3464) (GEOG 3464) (HD 3464) (HUM 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. (2H,3L,3C)

3504: POPULATION TRENDS AND ISSUES
Contemporary American and global population trends in historical and comparative perspective. Discussion of the impact of population change on individual and society. Relevant public policy questions examined. Pre: 1004. (3H,3C) II.

3604: WORK IN MODERN SOCIETY
Emphasis on the analysis of work, industrial work organizations, and trade unions. International comparisons on the nature of work and related developments in post industrial societies. I Pre: 1004. (3H,3C)

3614: GENDER AND WORK IN THE U.S.
Examination of the role that gender plays in shaping the experience of work, focusing especially on the persistence of occupational segregation by sex, its causes and implications. Also, the interaction of work and family life, including the allocation of household work and control of resources. Social policies affecting gender relations in work organizations will be analyzed. Pre: 1004. (3H,3C) II.

3714: SOCIOLOGY OF AGING
Emergence of old age as a social problem. Social aspects of aging in America, including the minority experience and with some cross-cultural comparisons. Social and demographic characteristics of the aged, location of aged in the social structure, and current and future social problems of old age. Pre: 1004. (3H,3C) II.

3954: STUDY ABROAD
Variable credit course. X-grade allowed.

4014: SOCIOLOGY OF THE FAMILY
The family as a basic social institution: similarities and variations in family systems, their interrelationships with other social institutions, and patterns of continuity and change. Taught alternate years. I Pre: 2014. (3H,3C)

4024: SOCIOLOGY OF RELIGION
Religion as a social structure as well as an institution; with special attention to the functions of religion for individuals, groups and societies, social organization; and the interplay between religion and other social institutions including economics and polity. Taught alternate years. I Pre: 1004. (3H,3C)

4034: SOCIOLOGY OF EDUCATION
Analysis of the structure, functions, and consequences of schooling in America, the social processes affecting academic achievement, and the implications of current knowledge for educational reform. Taught alternate years. I Pre: 1004. (3H,3C)

4044: MILITARY SOCIOLOGY
The military institution and its relationship to society. Emphasis on the role of the military and its social organization; recruitment, socialization, career, combat, deviant behavior, changes in the military, and future trends. Taught alternate years. Junior standing. Pre: 1004. (3H,3C) II.

4114: THE SOCIOLOGY OF POPULAR MUSIC
Examine the social context(s) of popular music, including the social, economic, and political factors that influence the development of different popular music forms; authenticity within popular music genres; popular music's impact on social activity and identity; the institutions that connect popular music producers with consumers. Pre: 1004, 1014 or AFST 1714. (3H,3C)

4194: SENIOR SEMINAR
Required seminar for majors. Integration and application of prior coursework, including reviews of theory and research methods. Application of sociological knowledge toward an actual needs assessment in a work setting, completion of a social policy analysis, and a written critique of a sociological publication. Course serves as a bridge to graduate study, prepares students for application of sociological knowledge, and provides overall career guidance. Senior standing and sociology majors only. Pre: 3104, 3204. (3H,3C)

4404: SOCIOLOGY OF LAW
The functions of law as a form of social control. The social forces in the creation, enforcement, and change of the law. The nature of law as a force in social change. Taught alternate years. Pre: 1004. (3H,3C) II.

4414: DRUGS AND SOCIETY
Examines the use of drugs, including legal and illegal drugs, from a sociological perspective. Cross-cultural and historical patterns of use are discussed and explained. Particular attention is given to drug use within the context of various social institutions. Junior standing. Pre: 1004. (3H,3C)

4704: MEDICAL SOCIOLOGY
Social and cultural response to illness and infirmity. Emphasis on the sick role, patient role, practitioner role, organization and politics of health care delivery, stratification, professionalism, and socialization of health practitioners. Taught alternate years. Junior Standing. I Pre: 1004. (3H,3C)

4714: SOCIOLOGY OF MENTAL ILLNESS
Mental illness and social systems, historically and in contemporary society. Distribution of mental illness with special reference to stratification, role, and deviance theories. Mental health occupations and organization of treatment. Implications for social policy. Taught alternate years. Junior standing. Pre: 1004. (3H,3C) II.

4724: SOCIOLOGY OF DEATH
Social implications of death and its relationship to social behavior and institutions. Social contexts of suicide, terminal illness, execution, and accidents. Death-related processes of funeralization, bereavement, and inheritance. Death in cross-cultural perspective. I Pre: 1004. (3H,3C)

4754: INTERNSHIP
Placement and sociologically relevant work in one of a variety of human service settings, combined with relevant readings, discussion and written work coordinated jointly by a faculty member and the setting supervisor. Placement settings include human resource agencies, corrections facilities, extension offices, and law agencies. Sociology major or minor required. Junior or Senior standing required. Consent of internship coordinator required. Coursework relevant to placement setting. Variable credit course. I,II,II,IV.

4764 (GEOG 4764) (UAP 4764): INTERNATIONAL DEVELOPMENT POLICY AND PLANNING
Examination of major development theories and contemporary issues and characteristics of low-income societies (industrialization, urbanization, migration, rural poverty, hunger, foreign trade, and debt) that establish contexts for development planning and policy-making. Junior standing required. I (3H,3C)

4804: SOCIOLOGY OF SCIENCE
Focus on the institution of science and its systems: normative, reward, and stratification. Concentrates on the interaction between science and other basic social institutions: political, economic, and religious. Taught alternate years. Junior standing. Pre: 1004. (3H,3C) II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Undergraduate Courses - Women's Studies (WS)

1824: INTRODUCTION TO WOMEN'S STUDIES
This interdisciplinary introduction to Women's and Gender Studies examines interrelations between men and women as social groups in the contexts of race, class and other systems of inequality. It places special focus on the diverse experiences of women and feminist struggles for social change. (3H,3C)

2114: FEMINIST THEORY
Examination of diverse theoretical perspectives on women and gender, including their historical origins and political implications. Special emphasis on integrative perspectives that also address race, class, and other dimensions of inequality. Pre: 1824. (3H,3C)

2224: WOMEN AND CREATIVITY
A study of the philosophical, artistic, and biographical dimensions of women's creativity in a wide variety of fields. (3H,3C)

2234 (REL 2234): WOMEN, ETHICS, AND RELIGION
Women's religious ethical formation; the roles and understandings of women in traditional and major modern religious traditions; authoritative writings and practices of various traditions as they focus on issues of sex and gender; gynocentric methods of study of women, ethics, and religion; feminist and womanist approaches to liberation and social change. (3H,3C)

2244: WOMEN AND SCIENCE
Uses research from the disciplines of science, women's studies, history, sociology, and philosophy to examine women's roles in the fields of science, technology, engineering, and mathematics. Starting with historical figures, students will follow the progress women have made in entering and succeeding in science careers. (3H,3C)

2254: FEMINIST ACTIVISM
Explores the history of individual and collective action geared toward gaining women's rights and improving women's positions in society. Course covers various tensions and shifts in feminist movements, as well as the perspectives, agendas, and actions of specific subgroups of women whose perspectives sometimes conflict. Service-learning is a required component of the course. (3H,3C)

2264: RACE, CLASS, AND GENDER
This course focuses on the interrelationships of race, class, and gender in the context of women's studies scholarship, and explores how these interrelationships have influenced the experiences of all people in the U.S. Students will learn to conceptualize these categories as interactive systems, not just as separate features of experience. Emphasis will be put on how race, class, and gender shape all social institutions and systems of meaning. Must have prerequisite or instructor's consent. Pre: 1824. (3H,3C) I,II.

2274: WOMEN IN THE MILITARY
This course covers historical and global perspectives on the experiences women have had in and with the military. This course introduces students to issues concerning women fighters and military families, as well as to debates over women in combat positions, military policies, and globalization. (3H,3C)

2734 (AFST 2734) (REL 2734): THE BLACK WOMAN IN THE U.S.
The emerging womanist perspective of "interstructured oppression" (i.e., the simultaneous effects of racism, sexism, and classism) as relevant to the contributions of Black women in the United States of America; views of Black women from African backgrounds, the Atlantic slave trade, and the progressive rise of womanist/feminist liberation movements in Black culture; contributions of Black women in the U.S. and globally. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3004: TOPICS IN FEMINISM
A variable topics course that addresses how the social construction of gender shapes social, cultural, political, economic, and institutional structures as well as individual experiences and perceptions. The course stresses interdisciplinary approaches to topics of emerging interest in feminist scholarship. Can be taken up to three times for credit with varying topic. In addition to WS 1824, must have taken a 2000-level Women's Studies course, or have instructor's consent. Pre: 1824. (3H,3C)

3214: GLOBAL FEMINISMS
An introduction to the gendered analysis of global women's issues with a special focus on women of color. Examines the multiple and diverse sites of feminist struggle within the third world, and between first and third worlds both in the U.S. and internationally. Studies the impact on women of political movements such as nationalism, colonialism, revolution, authoritarianism and democracy. Compares theories originating with women of color in the U.S. with those from international third worlds. Pre: 2264. (3H,3C)

3324 (STS 3324): PERSPECTIVES ON THE BIOLOGY OF WOMEN
Examines historical, social, and cultural views of women's biology and how those views have impacted women's physical and mental health. Special attention is paid to the influence of cultural traditions and beliefs on scientific perspectives. Pre: 1824. (3H,3C)

3984: SPECIAL STUDY
Variable credit course.

4214 (UAP 4214): WOMEN, ENVIRONMENT AND DEVELOPMENT IN A GLOBAL PERSPECTIVE
Explores intersecting roles of gender, culture, and socio-economic status in people's use of nature, management of environmental resources, and experiences of environmental change. Examines debates on environmental and development initiatives, environmental ethics, and environmental social movements from feminist perspectives. Pre: UAP 3344 or UAP 3354. (3H,3C) II.

4224: WOMEN'S STUDIES SEMINAR
This multi-disciplinary, multi-cultural course examines a significant topic in Women's Studies, utilizing the perspectives of history, biology, psychology, political science, sociology, and the arts. Variable topics. Pre: 1824, (2224. (3H,3C)

4704 (STS 4704): GENDER AND SCIENCE
Investigates the gender dimensions of science in both historical and contemporary perspectives. Discusses feminist studies of science, exploring strengths and limitations. Assesses implications of cultural assumptions about gender for practicing scientists. A 3000 level course in science or engineering may satisfy prerequisite. Pre: 2244 or HST 1504. (3H,3C)

4754: INTERNSHIP
Qualified students will be placed with a community agency or on-campus office which addresses contemporary issues of gender, class, and/or race, and will meet periodically with an appropriate faculty member to discuss assigned readings that will provide a context for the work experience. Students will also be expected to keep a journal and to write up a final evaluation of the experience. Variable credit: may be taken for up to 6 elective credits in the Women's Studies concentration. Junior standing, screening interviews with Tech faculty and with the service agency and consent required. Variable credit course. Pre: 1824.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY

Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Liberal Arts and Human Sciences

Theatre and Cinema (School of Performing Arts and Cinema)

www.theatre.vt.edu/

Patricia Raun, Head
Professors: A. G. Kilkelly, R. H. Leonard; S. Ott Rowlands; S. Prince; P. Raun; R. W. Ward
Associate Professors: W. S. Barksdale; D. W. Johnson; G. W. Justice; P. S. Lavender; P. A. Raun
Assistant Professors: J. Ambrosone; P. Harrill; R. McGrath; C. Rawlings; J. Stein
Instructors: K. Morgan; M.A. Williams; A. Maynor; K. Precoda
Career Advisors: G. W. Justice; R. W. Ward
Emeritus Professors: P. A. Distler; D. A. Drapeau; B. Dukore; F. N. Proctor
Adjunct Professor: E. Zulia

Overview

The curriculum in theatre arts is designed to provide the student with the essential approaches necessary to develop an informed understanding of literature and its practice. As such, the three basic aspects of the disciplines the theoretical, the historical, and the practical are emphasized.

A program in theatre arts leading to the B.A. is offered. In addition to fulfilling the core curriculum requirements of the College of Liberal Arts and Human Sciences and the Curriculum for Liberal Education, majors must complete a minimum of 42 hours in theatre arts. Theatre Arts majors are also required to complete English 4165 or 4166 (Shakespeare), as well as 3 hours each in other art forms.

A minor course of study in theatre arts may be chosen with the guidance of the student's advisor.

Limited scholarship support is available.

Satisfactory Progress

Satisfactory progress toward the B.A. in Theatre Arts requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

TA 2104: Fundamentals of Theatre Production	3
TA 2114: Script Analysis	3
TA 2134: Performance Lab	3
TA 2135, 2136: Design Lab	6
TA electives	3
Credits	**(18)**

1. Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.

Undergraduate Courses (FA)

2004: CREATIVITY & AESTHETIC EXPERIENCE
Guided exposure to participation in various experiences in the visual and performing arts; interaction with both historians/critics and practitioners prior to and after such experiences; examination of the many processes through which the visual and performing arts are created and communicated and how these arts illuminate and help to explain human experience. May not be repeated for credit. Pass/Fail only. (1H,1C) I,II.

Undergraduate Courses (TA)

2014: INTRODUCTION TO THEATRE
Appreciation and understanding of theatre through historical perspectives, comparison with other art forms, and primary acquaintance with practice and techniques of script interpretation, producing, directing, acting, and all aspects of design. (3H,3C) I,II,III,IV.

2024: INTRODUCTION TO ACTING
The course is designed to lead the non-theatre arts major to an awareness and appreciation of acting, both as a participant (actor) and as an observer (audience). Emphasis is placed on improvisation, ensemble, and scene work. (3H,3C) I,II,III,IV.

2054 (COMM 2054): INTRODUCTION TO FILM
Introduction to film as a medium for artistic communication. Sophomore standing required. Variable credit course.

2104: FUNDAMENTALS OF THEATRE AND PRODUCTION
Introduction to theatre vocabulary and understanding of the theatrical process, theatre aesthetics, theatrical modes of expression, basic script analysis, production analysis, theory and practice of collaboration, theatre organizations, history and operations of professional theatres. (TA majors and minors only). (3H,3C)

2114: SCRIPT ANALYSIS
Understanding of drama as an element of theatre with focus on the process of script analysis for theatrical production. (3H,3C) I,II.

2134: PERFORMANCE LAB
An introduction to the process of acting, through a variety of laboratory experiences, beginning with basic performance skills and culminating in the performance experience. Emphasis is on improvisation, terminology, physical action, script analysis, characterization, and rehearsal and performance techniques. Limited to Theatre Arts Majors. (6L,3C)

2135,2136: THEATRE DESIGN LAB
An introduction to the processes, technologies, and aesthetics of the visual design of theatrical productions. 2135: Scenography, costume, and stage lighting design are explored in history and contemporary theatre practice. 2136: A range of design problems will offer opportunity to learn various design approaches and provide practice with different media and means of design expression. (6L,3C) I,II.

2144: FOUNDATIONS OF MOVEMENT AND VOICE
An introduction to the process of acting, through a variety of laboratory experiences, beginning with basic performance skills and culminating in the performance experience. Emphasis is on various methods of performance style and analysis, theater movement and body conditioning, and vocal awareness and production. Limited to Theatre Arts Majors. Pre: 2134. (6L,3C)

2224: INTERMEDIATE PERFORMANCE INTENSIVE
This course provides the Theatre Arts major, who desires a rigorous exploration of acting, a forum for application of the techniques and skills learned. These skills will be strengthened and applied through observation of and participation in scene and monologue work. Focus will be placed on basic skills and concepts necessary to creative, truthful, and believable performance of selected scenes, including use of voice and body, imagination, relaxation, sense and emotion memory, and script analysis. Pre: 2134 or 2024, 2144. (3H,3C)

2414: STAGE AND LIGHTING TECHNOLOGY
A practical study of the technologies and specialized equipment employed in the construction, rigging and running of theatrical production; the planning and organization involved in mounting these productions; the tools, materials and techniques used to realize theatrical design and build scenery; and the fundamentals of stage lighting. (3H,3C)

2444: STAGE MAKEUP
Basic application of stage makeup with emphasis on corrective, modeling, and three-dimensional techniques. Taught alternate years. I (1H,6L,3C)

2604: INTRODUCTION TO ARTS MARKETING
An introduction to the theories and practice of marketing and building community engagement as applied to arts activities and professional not-for-profit arts organizations, through a survey of standard marketing approaches, examination of current practices in the field, and direct hands-on experience. (3H,3C)

2964: FIELD STUDY
Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014: THEATRE PRODUCTION LAB
Production experiences in the areas of performance, design and theatre technology, management, and writing. May be repeated for a maximum of nine credits. Instructor consent required. Variable credit course. X-grade allowed. I,II,III,IV.

3054 (COMM 3054): AMERICAN FILM GENRES
Close visual and cultural study of classic film genres. Emphasis is on the cinematic codes and narrative conventions which unify the genre and which are found in representative films. Exploration of genre films as symbols of American culture and society. Genres studied include Western, the

musical, and the detective film. Pre: 2054. (3H,3C)

3104: JAPANESE THEATRE
Survey of the historical background and distinguishing characteristics of traditional Japanese theatre with special focus on production techniques of Noh, Kabuki, and the Doll Theatre. Taught alternate years. (3H,3C) II.

3105,3106: HISTORY OF DRAMA AND THEATRE
History of drama and theatre from primitive ritual to the present day and its relationship to the social, economic, and political forces from age to age. 3105: primitive, Greek, Roman, Medieval, Renaissance, and Asian. 3106: Restoration, eighteenth, nineteenth, and twentieth centuries. Junior standing required. Pre: 2114. (3H,3C) I,II.

3114: SCENOGRAPHY TOPICS
Rotating topics in scenography and related specific design applications. Designed for theatre arts majors who have foundational training in areas of theatre design. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2136.

3124: COSTUME DESIGN AND TECHNOLOGY TOPICS
Rotating topics of costume design and costume technology. Designed for advanced theatre arts majors who have foundational training in all areas if theatre design. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2136.

3134: LIGHTING TOPICS
Rotating topics in lighting design and technology. Designed for advanced theatre arts majors who have foundational training in all areas of theatre arts. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2136, 2414.

3144: THEATRE DESIGN TOPICS
Rotating topics in design and theatre technology. Designed for advanced theatre arts majors who have foundational training in all areas if theatre technology and design. May be repeated for unlimited number of credit hours. (Variable credit) Variable credit course. Pre: 2414, 2136.

3154: PERFORMANCE TOPICS
Rotating topics in performance skills and theories. Designed For advanced theatre arts majors who have foundational training in acting, voice and movement. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2224, 2144.

3164: VOICE AND SPEECH TOPICS
Rotating topics in voice and speech skills, and theories and practice in performance. Designed for advanced theatre arts majors who have foundational training in acting, voice and movement. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2224.

3174: MOVEMENT TOPICS
Rotating topics in theatre movement, dance for the theatre and theories of physical expression in the performing arts. Designed for advanced theatre arts majors who have foundational training in acting voice and movement. May be repeated for credit. (Variable credit) Variable credit course. Pre: 2144.

3194 (COMM 3194): DIGITAL CINEMA PRODUCTION
Basic production techniques, aesthetics, and technology of digital cinema production. Variable credit course. Pre: 2054.

3315-3316 (ENGL 3315-3316): PLAYWRITING
A workshop course in the craft and art of playwriting which emphasizes the development of craft and the nurturing of vision and art. 3315: primary focus is on the writing of original scripts with additional attention paid to the work of influential playwrights and critics. 3316: primary focus is on the creative process of developing a play with the collaborative influences of a director, actors, designers, and other theatre professionals. Consent of instructor required. Pre: ENGL 1106 or ENGL 1204H or COMM 1016 for 3315; 3315 for 3316. (3H,3C)

3604: ARTS MANAGEMENT
The development of the not-for-profit arts organization, structures and characteristics of boards of directors, artistic missions and goals, funding, volunteer support, and fiscal control. Junior standing required. Taught alternate years. (3H,3C) II.

3624: STAGE MANAGEMENT
The systems, procedures, forms, and duties of the stage manager in the professional, academic, and community theatre are explored in relationship to the production process and other theatre artists. Taught alternate years. Pre: 2014. (3H,3C) II.

3954: STUDY ABROAD
Variable credit course.

4014: CONTEMPORARY THEATRE SEMINAR
Issues and concerns in contemporary theatre; production philosophies and approaches, employment opportunities, career options, and preparation of portfolio and resume materials. Junior standing required. (3H,3C) II.

4084 (COMM 4084): FILM HISTORY
Aesthetic, economic, social and technological history of world cinema; film theory as it relates to the history of cinema. Junior standing required. Variable credit course. Pre: 2054.

4294 (COMM 4294): WRITE/DIRECT DIGITAL CINEMA
Advanced course in digital cinema production exploring the practice of writing, producing, and directing dramatic motion pictures. Variable credit course.

4304: THEATRE OUTREACH
Participation in theatre projects or activities that focus on community and social issues. May be repeated for a maximum of six credits. Junior standing and instructor consent required. Variable credit course. I,II.

4315-4316: DIRECTING
Script analysis, theories, techniques, and practical applications of theatrical direction. 4315: Theories and aesthetics of directing, functions of the director, script analysis, basic principles and techniques of staging. 4316: Rehearsal techniques, style determination realism, and non-realism. Senior standing required. (3H,3C) I,II.

4344 (COMM 4344): ADVANCED TOPICS IN FILM
Selected topics in advanced film studies; emphasis on critical analysis and application. May be repeated up to a maximum of 6 credit hours with different content. Variable credit course. Pre: 2054.

4354 (COMM 4354): THE FILM DIRECTOR
Close thematic and visual analysis of the films of a single director. Directorial style assessed in terms of recurring visual and thematic patterns. Development and evolution of the director's style, and comparison with filmmakers whose work lacks a unifying "signature". Pre: 2054. (3H,3C)

4394 (COMM 4394): ADVANCE CINEMA PRODUCTION
Advanced cinema course in motion picture lighting, editing theories and digital post-production techniques. Variable credit course. Pre: 3194.

4704: PROFESSIONAL THEATRE INTERNSHIP
Internship of one semester in acting, directing, management, design, or technical theatre with a professional equity company for selected advanced students; classroom, workshop, and production experiences. Minimum 9 credits, maximum 15 credits. Audition and consent. Variable credit course. I, II,III,IV.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Liberal Arts and Human Sciences Programs of Study
Air Force ROTC | Apparel, Housing & Resource Management | Army ROTC | Communication | English
Foreign Languages and Literatures | History | Human Development | Interdisciplinary Studies | International Studies
Music | Navy ROTC | Philosophy | Political Science | School of Education
Science and Technology in Society | Sociology | Theatre Arts

College of Natural Resources

www.cnr.vt.edu/

Paul M. Winistorfer, Dean
Associate Dean, Undergraduate Programs: Richard G. Oderwald
Associate Dean, Research and Graduate Programs: Robert J. Bush
Associate Dean, Engagement: Robert L. Smith
Assistant Dean for Administration and Finance: Thomas E. Olson
Academic Counselor: Susan S. Leslie
Recruitment and Career Coordinator: Judith C. Araman

Overview

The College of Natural Resources, through offerings in the Departments of Fisheries and Wildlife Sciences, Forestry, Geography, and Wood Science and Forest Products, provides an integrated education in renewable natural resource management, conservation, and utilization as well as a valuable perspective for understanding and solving critical contemporary environmental problems at local, regional, and global scales.

All undergraduate programs of the College of Natural Resources are designed to provide a professional education that starts with core courses emphasizing physical, biological, and social sciences, along with concepts of renewable natural resource management. More advanced courses teach the principles and practices of individual disciplines, along with advanced skills in communications and computer use. Students prepare for professional careers with public agencies responsible for managing forest, water, wildlife, fish, and recreation resources; with private firms concerned with producing, manufacturing, and marketing wood products; with planning agencies and private firms utilizing skills in environmental and land-use analysis and geospatial techniques; or for graduate studies.

Students develop a specialization. These majors with options are described below and are administered by departments:

Department of Fisheries and Wildlife Sciences

- Fisheries Science
- Wildlife Science

Department of Forest Resources and Environmental Conservation

- Forestry
  - Environmental Resource Management option
  - Forest Resource Management option
  - Industrial Forestry Operations option
  - Urban Forestry option
- Natural Resources Conservation
  - Natural Resource Recreation option
  - Natural Resources Education (K-6) option
  - Natural Resources Science (6-12) option

Department of Geography

- Geography
  - Culture, Regions and International Development option
  - Geospatial and Environmental Analysis option

Department of Wood Science and Forest Products

- Wood Science and Forest Products
  - Adhesion Science option
  - Forest Products Marketing and Management option
  - Manufacturing Systems option
  - Non-timber Forest Products option
  - Packaging Science option
  - Wood Structures and Materials option

The college offers minors in Forestry, Natural Resource Recreation, Geography and Packaging Science. Contact the respective departments for more information on minors.

Accreditation

The educational programs in Forest Resource Management, Industrial Forestry Operations, Environmental Resource Management, and Natural Resource Recreation qualify graduates as professional foresters and are accredited by the Society of American Foresters, the recognized accrediting body. Graduates in fisheries and wildlife sciences meet certification requirements of the American Fisheries Society and The Wildlife Society, respectively. The Wood Products and the Forest Products Marketing and Management programs are accredited by the Society of Wood Science and Technology, the recognized accrediting body.

The Honors Program

The University Honors Program is available to students in the College of Natural Resources. The program provides enriched opportunities for highly qualified and motivated undergraduate students. Faculty advisors can provide additional information.

Cooperative Education

The college encourages students to become involved in the Cooperative Education Program, in which students alternate on-campus academic terms with off-campus employment in their areas of interest. Additional information is provided in "Academics."

Exchange Programs

The College of Natural Resources participates in reciprocal exchange programs with the University of Melbourne in Australia, the University of Canterbury in Christchurch, New Zealand, and the University of Stellenbosch, Republic of South Africa. Where appropriate, students can also participate in the International Student Exchange Program.

Graduate Programs

The college offers educational programs leading to the M.S., M.F., and Ph.D. Complete information on these programs is in the Graduate Catalog.

Undergraduate Course Descriptions (NR)

1114: INTRODUCTION TO RENEWABLE NATURAL RESOURCES
Introduction to careers in forestry, wildlife, fisheries, recreation, and forest products professional fields. Discussion of current global and regional problems affecting natural resource professionals. (1H,3L,2C) I.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3954: STUDY ABROAD
Variable credit course.

3964: FIELD STUDY
Variable credit course.

4404 (ALS 4404) (GEOG 4404) (UAP 4404): APPROACHES TO INTERNATIONAL DEVELOPMENT
An introduction to issues relating to international development. The course will focus on areas to help students better understand the interdependencies between countries and how institutions and organizations can foster effective working relationships on global projects of mutual interest between countries. (1H,1C) I.

4614 (ALS 4614): WATERSHED ASSESSMENT, MANAGEMENT, AND POLICY
Multidisciplinary perspectives of assessment, management, and policy issues for protecting and improving watershed ecosystems. Topics include: monitoring and modeling approaches for assessment, risk-based watershed assessment, geographic information systems for watershed analysis, decision support systems and computerized decision tools for watershed management, policy alternatives for watershed protection, urban watersheds, and current issues in watershed management. Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FOR, GEOL, LAR, CSES, ENT, BIO, GEOG, AAEC, UAP or equivalent. (2H,2C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

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Agriculture & Life Sciences | Architecture & Urban Studies | Engineering | Liberal Arts and Human Sciences
Natural Resources | Pamplin College of Business | Science | Veterinary Medicine

College of Natural Resources

Fisheries and Wildlife Sciences

www.fishwild.vt.edu

Eric Hallerman, Head
Professors: P. L. Angermeier; J. D. Fraser; E. M. Hallerman; B.R. Murphy; D. J. Orth; D. F. Stauffer; M.R. Vaughan
Associate Professors: K. A. Alexander; J. M. Berkson; C. A. Dolloff; C. A. Haas; W. Hopkins; S. McMullin; J. A. Parkhurst; M. J. Kelly
Assistant Professors: Y. Jiao; A. D. Lemly; S. Karpanty; E. Frimpong
Adjunct Professors: B. Czech; W. Hershberger; T. J. Newcomb; E. Smith; S.A. Smith; J. Walters; Y. Palti
Career Advisors: *Fisheries Undergraduate*, B. R. Murphy (231-6959); *Wildlife Undergraduate*, C. Haas (231-9269) *Graduate*, S. McMullin (231-8847).

Fisheries Science

The Fisheries Science program is for students interested in research and management of aquatic animals and ecosystems, including wild fish and shellfish, endangered species, and hatchery-raised fish. Many students also qualify for a minor in biology. Most graduates work for state or federal fisheries agencies, environmental consulting firms, or public utilities. Because the more challenging and rewarding jobs require a master's degree, the program emphasizes preparation for graduate study.

Wildlife Science

The Wildlife Science program is for students interested in research and management of terrestrial animals and ecosystems, including game birds and mammals, non-game animals, and endangered species. Many students also qualify for a minor in biology. Most graduates work for state or federal wildlife agencies, environmental consulting firms, or private land management companies. Because the more challenging and rewarding jobs require a master's degree, the program emphasizes preparation for graduate study.

Undergraduate Courses (FIW)

2114: PRINCIPLES OF FISHERIES AND WILDLIFE MANAGEMENT
Basic principles guiding the management of fish and terrestrial animals in wild habitats. Management of organisms, habitats, and human users examined in terms of biological, chemical/physical, ecological, and sociological theories and practices. Worldwide illustration from both recreational and commercial resources. I Pre: BIOL 1006 or BIOL 1106. (3H,3C)

2314: WILDLIFE BIOLOGY
Summary of biological characteristics of wild birds and mammals, especially relating to management by humans. Physiological, functional, structural, and behavioral adaptations of individuals to their environments and foods. Pre: (BIOL 2504 or BIOL 2704), FIW 2114. (3H,3C) II.

2324: WILDLIFE FIELD BIOLOGY
Systematics, identification, and natural history of common native vertebrates and plants. Exposure to habitats/ecosystems of western Virginia. Observation, collection, and reporting of field data. Self-scheduled field and media lab activities required. Pre: BIOL 1106. (1H,6L,3C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3514: FISHERIES TECHNIQUES
Application of field and laboratory methods in fisheries management and research. Experience with fisheries equipment and techniques. I Pre: 2114. (1H,6L,3C)

3954: STUDY ABROAD
Variable credit course.

3964: INTERNSHIP THROUGH DIRECTED FIELD STUDY
Variable credit course.

4214: WILDLIFE FIELD TECHNIQUES
Field research methods for wild vertebrates in terrestrial environments. Application of research methodology including animal capture and marking, determination of sex, age, and condition, radio telemetry and map/compass/GPS orienteering, non-invasive methods of capture, habitat selection, and supervised group research projects. Co: 4414, STAT 3005. (2H,3L,3C) II.

4314: CONSERVATION OF BIOLOGICAL DIVERSITY
Principles and practices of conserving biological diversity. Causes, consequences and rates of extinction. Application of philosophical, biological, sociological and legal principles to the conservation of genes, plant and animal species and ecosystems. I Pre: 4414, 4434. (3H,3L,4C)

4414: POPULATION DYNAMICS AND ESTIMATION
Population growth, structure, and regulation of fish and wildlife populations including harvested populations, non-harvested populations, and small or declining populations. Methods of estimating demographic parameters such as population size, survival, and recruitment. Population viability analysis and genetic considerations in population dynamics. Pre: 2324. Co: 4214. (3H,3C) II.

4424: ICHTHYOLOGY
Morphology and physiology, systematics, zoogeography, and identification of fishes. Pre: BIOL 2504 or BIOL 2704. (2H,6L,4C) II.

4434: WILDLIFE HABITAT ECOLOGY AND MANAGEMENT
Relationship of wildlife species to their habitats. Factors influencing distribution and abundance of wildlife populations. Vegetation succession and structure, habitat classification, modeling wildlife habitat relationships and management of habitats in forests, agricultural lands, rangelands, riparian/ wetland and urban areas. Pre: 2114, FOR 3364. (3H,3C) II.

4444: ROLE OF SCIENCE IN NATURAL RESOURCE MANAGEMENT
Alternative views of the role of the individual scientist within resource management. Synthesis and application of previous fish and wildlife coursework applied to complexities associated with real world issues. Case studies from fisheries management, wildlife management, and conservation biology. Defining students' individual career goals. Pre: 4414. (3H,3C)

4454: VERTEBRATE PEST MANAGEMENT
Management of vertebrate pest species. Causes and prevention of damage by vertebrate pest species to: food and fiber plants, animal production, structures, human transportation systems, and health of humans and domestic animals. Senior standing required. (3H,3C) II.

4464: HUMAN DIMENSIONS OF FISHERIES AND WILDLIFE
Values, attitudes, and opinions of people toward fish and wildlife. Social, economic, legal, and political aspects of fisheries and wildlife management. Roles of professionals and the public in fish and wildlife policy processes. Contemporary fish and wildlife policy issues. Senior standing required. I Pre: 2114. (3H,3C)

4474: WILDLIFE HABITAT EVALUATION
Application of methods for habitat evaluation through a group project to develop a habitat management plan. Students apply methods used to quantify habitat quality and assess impacts of various management actions. Emphasis is on Habitat Suitability Index models and the Habitat Evaluation Procedures approach of the US Fish and Wildlife Service. Pre: 4214, FOR 3365, STAT 3005. Co: 4434. (3L,1C)

4484 (BIOL 4484) (ENT 4484): FRESHWATER BIOMONITORING
Concepts and practices of using macroinvertebrates and fish to monitor the environmental health of freshwater ecosystems. Effects of different types of pollution and environmental stress on assemblages of organisms and underlying ecological principles. Role of biological studies in environmental regulation. Study design, field and laboratory methods, data analysis and interpretation, verbal and written presentation of results. Pre: (BIOL 2804), (BIOL 4354 or BIOL 4004 or ENT 4354 or FIW 4424 or FIW 4614). (3H,3L,4C)

4514: PRINCIPLES OF AQUACULTURE
Requirements of aquatic organisms in captivity. Husbandry of fish and invertebrates, including nutrition, water quality, and disease control. Design of fish rearing facilities. Two day-long field trips required. Pre: 2114. (2H,3L,3C) II.

4524: GENETICS FOR AQUACULTURISTS
Genetics of sex determination, qualitative and quantitative traits in aquatic organisms. Selective breeding and biotechnology-based methods of genetic improvement. Case studies. Pre: BIOL 2004, FIW 4514. (3H,3C) I.

4534: ECOLOGY AND MANAGEMENT OF WETLAND SYSTEMS
Introduction to the variety of wetland systems found in North America, though emphasis will focus on eastern and mid-Atlantic wetland systems. Origin and processes of formation of wetlands, functions and values of wetlands, wetland delineation, wetland classification, regulatory processes

affecting wetlands. Objectives of and management techniques used to protect and/or manipulate wetland systems for wildlife and other human needs. Enrollment restricted to junior, seniors and graduate students. (2H,3L,3C)

4614: FISH ECOLOGY
Interactions of fish with the physical and biological environment. Adaptations of organisms, populations, and communities. Impacts of human activities on major aquatic ecosystems and important fishes. Ecological principles for management of important sport, commercial, and prey fishes. Pre: BIOL 1006. (3H,3C) II.

4624: MARINE ECOLOGY
Marine organism, biological, ecological, chemical and physical processes of marine ecosystems in open sea, coastal and benthic environments, research methods and models in marine ecosystem simulation; fisheries in a dynamic ecosystem: human interference and conservation. Pre: BIOL 2804 or BIOL 2804 or GEOS 3034 or GEOS 3034. (3H,3C)

4714: FISHERIES MANAGEMENT
History, theory, and practice of fisheries management. Emphasis on basic strategies used in effective management and setting management objectives. Synthesis of fish population dynamics and manipulation, habitat improvement, and human management to achieve objectives. Case studies of major fisheries. Pre: 3514. (3H,3L,4C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Natural Resources

Forest Resources and Environmental Conservation

www.forestry.vt.edu

Janaki Alavalapati, Head
University Distinguished Professor: H. E. Burkhart
The Honorable & Mrs. Shelton H. Short, Jr. Professor: J. R. Seiler
Professors: G. S. Amacher; W. M. Aust; R. B. Hull; J. M. Kelly; R. G. Oderwald; M. R. Reynolds, Jr.[1]; B. J. Sullivan; R. H. Wynne; S. M. Zedaker
Associate Professors: A. M. Brunner; C. A. Copenheaver; T. R. Fox; J. L. Kirwan; S. P. Prisley; P. J. Radtke
Assistant Professors: M.C. Bolding; G. Busby; S.D. Day[2]; J.F. Munsell; M.J. Stern; V. A. Thomas; P. E. Wiseman
Affiliated Faculty: L. Travis
Adjunct Faculty: H. L. Allen; D. C. Chojnacky; K. H. Johnsen; P. D. Keyser; D. L. Loftis; J. L. Marion; F. D. Merry; R. D. Oliver; J. A. Scrivani; J. M. Vose
Courtesy Appointments: R. H. Jones (Biology); P. A. Miller (Landscape Architecture); S. M. Salom (Entomology)
Senior Research Associate: R. L. Amateis
Research Associate: K.R. Peer
Career Advisors: H. E. Burkhart (231-5483); R. G. Oderwald (231-5297)
[1] Joint Appointment with Statistics
[2] Joint Appointment with Horticulture

Forest Resource Management

The Forest Resource Management option emphasizes the biology, policy, and management skills needed to ensure the sustainability of the many renewable forest resources on which society depends. Graduates manage the forested landscape to provide society a renewable supply of wood and paper products along with clean water, recreation opportunity, wildlife habitat, and environmental quality.

Industrial Forestry Operations

Industrial Forestry Operations graduates are well prepared for careers in private industry emphasizing harvesting and reforestation operations. Industrial Forestry Operations specializes beyond the Forest Resource Management option by emphasizing the operations side of forestry along with landowner assistance and management skills for people and business.

Environmental Resource Management

The Environmental Resource Management option develops professionals who tackle a variety of environmental issues in the forested landscape. The foundation of this area of study is the same as the Forest Resource Management option with additional emphasis placed on water resources, forest soils, environmental policy, and wildlife management.

Urban Forestry

The Urban Forestry option produces graduates who can deal with the ecological and biological characteristics of the forest in an urban environment, as well as the managerial and political context within which forest management takes place. Special education, training, and experience are necessary to address the many and complex biological, social, economic, and political issues that are part of the urban forest setting.

Natural Resource Recreation

Natural Resource Recreation blends natural sciences, resource management, and social sciences disciplines and topics. Graduates provide high quality recreation experiences to ever increasing numbers of recreationists while protecting the natural environment on which these experiences depend. Emphasis is on the human dimensions of natural resource management.

Natural Resources Education (K-6) and Natural Resources Science (6-12)

Natural Resources Education prepares students to teach in elementary schools, while Natural Resources Science prepares students to teach Earth Science, Life Science or Agricultural Education at middle and high schools. Both options are intended as feeders into the Masters in Education at Virginia Tech, which provides necessary licensure. With proper planning, the Masters degree can be completed in one year.

Watershed Management

Watershed Management will qualify students for hydrology positions with the USDA and the USGS.

Undergraduate Courses (FOR)

2114: ECOLOGY APPALACHIAN FORESTS
Introduction to the natural history, tree biology, tree identification, forest ecology, management and forest types of the Appalachian region. Contemporary issues related to forest functions will be discussed including carbon storage, global warming, invasive forest species, wildlife management, fire, biofuels, agroforestry, urban forests, ecosystem restoration, clean water, recreation, and use of renewable resources. (3H,3C)

2214: INTRODUCTION TO LAND AND FOREST MEASUREMENTS
Measurement of forest land and vegetation attributes including geographic position, land distance, direction and area, tree size and forest overstory and understory vegetation attributes. Use and development of maps used in natural resources inventories. Use of global positioning systems and geographic information systems in the acquisition and management of land and forest measurements. Assessment of tree and forest attributes with sample plots. Use of computer software to manage and analyze data and present results. Pre: MATH 1016. Co: 2324. (2H,3L,3C)

2314: FOREST BIOLOGY AND DENDROLOGY
Introduction to the botany, physiology, genetics and silvics of important forest trees of North America. I Pre: BIOL 1006 or BIOL 1106. Co: 2324. (2H,2C)

2324: DENDROLOGY LABORATORY
Field identification of trees of North America with particular emphasis on trees native to the Eastern United States. I (3L,1C)

2514: WILDLAND FIRE: ECOLOGY AND MANAGEMENT
Provide students with basic knowledge on how: fire has an impact on forest environments; the environment and weather influence fire behavior; wildland fires are suppressed; and fire is used as a land and vegetation management tool. The course will also provide students with the knowledge and training to qualify as a basic wildland firefighter (FFT2-Red Card). Extended laboratory sessions will provide practice in fire behavior prediction, prescribed burning techniques, and fire control methodology. Pre: BIOL 1105 or BIOL 1106, CHEM 1035. (2H,3L,3C)

2554 (LAR 2554): NATURE AND AMERICAN VALUES
Introduces students to the evolving relationship between nature and American society; emphasizing the ethics and values which underlie forest, park, and wildlife management. Students are introduced to contemporary land use issues and learn to articulate, defend, and critique the ethical positions surrounding these issues (i.e., wilderness, sustainability, biodiversity, hunting, old growth, suburban sprawl, environmental activism). (3H,3C) I,II.

2714: INTRODUCTION TO INDUSTRIAL FORESTRY OPERATIONS
The forest management operations carried out by the forest industry such as harvesting, site preparation, regeneration, silvicultural treatments, and stand maintenance. I (1H,1C)

2784 (WOOD 2784): WORLD FORESTS AND FOREST PRODUCTS
A socio-economic approach to examining the management and use of the world's forests, enhance knowledge of global forest resources and products, and understand the roles and relationships of key stakeholders. Sophomore standing. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3215-3216: FOREST MEASUREMENTS
Principles and practices of forest land and resource measurements. 3215: Measurement of distance and direction, size and content of felled and

standing trees, elements of forest inventory, and sampling. 3216: Derivation of volume and weight equations for standing trees, equal and unequal probability sampling in timber inventory, site quality, stand density, forest growth, and yield modeling. Pre: 2214. (3H,3C) I,II.

3224: FOREST MEASUREMENTS FIELD LABORATORY
Field practice in forest measurements, forest inventory, and forest growth estimation. Co: 3216. (3L,1C) II.

3314: FOREST ECOLOGY AND SILVICS
Environmental factors affecting the establishment, growth, and development of forests; silvical characteristics of trees; forest community structure and function; forest ecosystem analysis. I Pre: 2314, (CSES 3114 or CSES 3134). (2H,4L,3C)

3324: SILVICULTURE PRINCIPLES AND APPLICATIONS
Theory and practices involved in controlling forest establishment, composition, and growth are developed in a regional context. Formulation of silvicultural systems and the study of reproduction methods, site preparation, intermediate stand manipulations, and reforestation operations. Pre: 3314. (3H,4L,4C) II.

3334: SILVICULTURE FIELD LAB
Practice and observation of various silvicultural procedures, including stand and site evaluation, intermediate cuttings, site preparation, vegetation control, harvesting, and regeneration. Co: 3324. (4L,1C) II.

3344: FOREST FIELD STUDIES
Field observations and discussion of current forestry operations and practices. Junior standing required. Pass/Fail only. (3L,1C)

3354 (HORT 3354): URBAN FORESTRY AND ARBORICULTURE
A study of the uses, biology, ecology and silviculture of trees and forested green space in urban and urban-rural interface environments. Planning, planting, establishment, growth and development of urban trees, site assessment, individual tree condition assessment, and tree maintenance; special emphasis on energy relationships, soil physical and chemical properties, soil stabilization, and insect and disease problems that are related to existing and planned trees and forested areas. Lab provided practical experience in arboriculture and tree care practices. Pre: (2314, 2324) or (HORT 3326). (2H,3L,3C)

3364: FOREST ECOLOGY AND SUSTAINABILITY
Survey of the forest, its environment, and its management including forest community structure and function, properties and management of forest soils, and basic silviculture. Partially duplicates 3314. I Pre: 2324. (2H,4L,3C)

3424: FOREST RESOURCE ECONOMICS
Application of economic principles to problems in forestry such as multiple use of forest lands, including wildlife, recreation, watershed, timber production and consumption. I Pre: ECON 2005 or AAEC 1005. (3H,3C)

3434: FOREST MANAGEMENT FIELD LAB
Field instruction and practice in forest management techniques, including tract and boundary location; tract and timber valuation; delineation of forested wetlands; pre-harvest planning; and writing sustainable forest management plans using financial, biological, and operational considerations. Pre: 3216, 3324, 3424. (3L,1C)

3524: ENVIRONMENTAL INTERPRETATION
Interpretation theory and techniques; program planning and evaluation; role of interpretation in enhancing visitor experiences and protecting park resources. Pre: 2554. (2H,3L,3C) II.

3534: OUTDOOR RECREATION FIELD STUDIES
Field instruction and practice in measuring amount and type of recreational use, and resource impacts from recreational use. Field inspection and review of federal, state, local, and private recreation areas and management in Virginia and elsewhere. Pre: 2554. Co: 3544. (1H,9L,4C) II.

3544: OUTDOOR RECREATION MANAGEMENT
Outdoor recreation management objectives; land acquisition; use measurement; impact assessment; facility operation and maintenance; role of private sector. Pre: 2554. (3H,3C) II.

3554 (FIW 3554): OUTDOOR RECREATION POLICY
Policy process for outdoor recreation, with emphasis on the federal level; major federal policies for outdoor recreation; role of the professional in the policy process; public involvement in planning and management; analysis of current policy issues. Pre: 2554. (3H,3C) II.

3564: OUTDOOR RECREATION PLANNING
Techniques of planning for resource-based outdoor recreation, including: estimation of recreation demand; wildland recreation classification and resource inventory; methods of public involvement; social impact analysis; state comprehensive planning; site design; and values questions associated with these techniques. Pre: 2554. (3H,3C) II.

3574: ENVIRONMENTAL EDUCATION SERVICE LEARNING
Introduction to key concepts in environmental education and teaching skills through lecture, discussion, service learning, and reflection. Training in internationally recognized environmental education curricula (e.g. Project Learning Tree, Project Wet), in class management and organization skills and in theory relevant to both teaching and learning. Students develop and conduct after school environmental education programs at local elementary schools (2H,3L,3C)

3714: FOREST HARVESTING
Principles and application of forest harvesting. Terminology, phases, function, and the interrelationships of people, money, machines, and environment. I Pre: 2214. (2H,3L,3C)

3724: FOREST BOUNDARIES AND ROADS
Application of basic land surveying and forest measurement techniques to the location, establishment, and maintenance of forest boundaries and roads. Consideration of stream crossings, best management practices, and costs. Pre: 2214. (2H,3L,3C)

3734: TIMBER PROCUREMENT
Analysis of the U. S. forest industry raw material supply process with emphasis on the evolution and dynamics of timber procurement systems and strategies. Pre: 3215. (2H,2C) II.

3954: STUDY ABROAD
Variable credit course.

3964: INTERNSHIP THROUGH DIRECTED FIELD STUDY
Variable credit course.

4114: INFORMATION TECHNOLOGIES FOR NATURAL RESOURCE MANAGEMENT
An introduction to computer information systems used in natural resources management. Course will introduce students to the theory and applications of database management systems (DBMS) and geographic information systems (GIS). Uses, challenges, and limitations of these technologies in natural resource management applications will be discussed. Students will receive extensive hand-on instruction in the use of current software packages for DBMS and GIS. Pre: 2214 or GEOG 2314. (2H,3L,3C)

4214: FOREST PHOTOGRAMMETRY AND SPATIAL DATA PROCESSING
Films, filters and camera photogeometry; scale; measurement estimation; image processing; flight planning and photo acquisition; geographic information systems; spatial data analysis techniques and applications. Senior standing required. I (2H,3L,3C)

4334 (CSES 4334): PRINCIPLES AND PRACTICE OF AGROFORESTRY
Biological, social, economic, and technical aspects of agroforestry, training and technology transfer techniques, and application of forestry and agriculture principles. Roles of animals and fish, trees, and agricultural crops in agroforestry systems. Community involvement in planning and implementation of agroforestry projects. I (3H,3C)

4354: FOREST SOILS AND HYDROLOGY
Principles of forest soils and hydrology and applications to forest management. Forest soil development, relationships of soil and hydrologic properties to tree growth, and the management of soil and soil water to enhance fiber production. I Pre: 3314. (2H,3L,3C)

4364: ADVANCED SILVICULTURE AND FOREST VEGETATION MANAGEMENT
Advanced topics in silviculture with an emphasis on species silvical differences; forest vegetation management and control, herbicides used in forestry, their chemistry, toxicology, application technology; environmental considerations; tree improvement, individual tree growth, and stand dynamics as affected by intermediate silvicultural operations; implications of atmospheric deposition. Pre: 3324. (3H,3C) II.

4374: FORESTED WETLANDS
Classifications, jurisdictional delineation, and management options of forested wetlands. Relationship of hydrology, soils, and vegetation to ecosystem processes, societal values, and management with regard to environmental and legal considerations and best management practices. Emphasis is on forested wetlands in the southern U.S., but national and international wetlands are included. Pre: CSES 3114 or CSES 3134. (3H,3C) II.

4424: FOREST RESOURCE MANAGEMENT
Examines classical and current forest decision-making principles and methods under various owner objectives. Explores the implications of managing forest resources in a multiple-resource setting. I Pre: 3216, 3314, 3424. (2H,3L,3C)

4434: FOREST RESOURCE POLICY
Historical development of U.S. forest resource policy. Key issues in each of the major forest uses. Policy determination at the federal, state, and private levels. Policy conflict resolution. Senior standing required. (3H,3C) II.

4444: INTEGRATED FOREST MANAGEMENT PRACTICUM
Student teams apply accumulated discipline-oriented knowledge and techniques to a real forest resource management problem. A practicum in forest resource management and planning, applying multiple use concepts to solve a forest management problem. Senior standing required. Must be Forestry major. (1H,8L,3C) II.

4454: URBAN FOREST MANAGEMENT AND POLICY
Focuses on the planning, administration, financing and management of trees, forests and green space associated with urban areas and the urban/rural interface. It will include a study of the social needs and values of urban situations; urban tree/forest resource inventories; tree and vegetation ordinances; the development, financing, and management of tree maintenance programs; and community involvement, public relations, and urban forestry education programs. Senior standing. Pre: 3354. (2H,3L,3C) II.

4474: THE CONSULTING FORESTRY BUSINESS
Objectives of private timberland owners and forest industry from the perspective of professional consultants. Organization of a successful consulting firm. Stresses service to landowners such as appraisal, marketing, taxation, economic analysis, and ethics. Co: 4424. (2H,3L,3C) II.

4514: FOREST AND TREE PEST MANAGEMENT
Identification and ecology of biotic and abiotic influences on forest and landscape tree health. Developing a theoretical and practical understanding for diagnosing and managing pests and stresses of trees in both the forest and landscape setting. Insects and diseases that attack trees. Pre: 3324 or HORT 3325 or HORT 3326. (2H,3L,3C)

4544: SEMINAR IN OUTDOOR RECREATION
Practitioner-oriented capstone laboratory exercise in outdoor recreation planning and management. Senior standing in Outdoor Recreation Option required. (1H,3L,2C) II.

4614: ECONOMICS OF FOREST PRODUCTS MARKETING
Economics of marketing forest products. Pricing, marketing channels and institutions, marketing research, product policy and planning, forecasting. Pre: 3424. (3H,3C) II.

4714: HARVESTING SYSTEMS EVALUATION
Principles and techniques for evaluating harvesting machines and systems design, application, productivity, and financial performance. Pre: 3216, 3424, 3714, 3734. (3H,3C) II.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Natural Resources

Geography

www.geography.vt.edu

L. William Carstensen, Head
Professors: J.B. Campbell; L.W. Carstensen; L.S. Grossman
Associate Professors: S. R. Brooker-Gross
Assistant Professors: K. M. de Beurs; L.M. Kennedy; K.N. Kolivras; L.M. Resler
Instructors: J. D. Boyer; D. F. Carroll; R. D. Oliver
Research Associate: P. Sforza
Career Advisors: L. W. Carstensen; J.B. Campbell (231-6886)

Overview

Geography offers a unique perspective on many of today's most important issues--from globalization, international development, and culture change to environmental problems, population growth, and climate change. Its theories and methods provide analytical techniques applicable to a wide range of questions significant to a broad spectrum of occupations. The geography major provides a balance between an education focusing on contemporary social, political, economic, and environmental issues and training in advanced computer-based techniques.

The department offers courses in human geography, physical geography, and geospatial computer techniques. Human geography is concerned with the spatial dimensions of the economy, politics, and culture; the significance of where people and their activities are located; how the movement of people, resources, and ideas creates links between rural and urban areas and between different regions of the world; the relationships between peoples and their environments; patterns of resource use; how differences and inequalities revealed in spatial patterns affect the quality of life; and how the processes of globalization are transforming regions, countries, and localities. Physical geographers study patterns of climate, landforms, vegetation, soils, water, and natural hazards and especially the factors and processes that produce those patterns, including human-environment interactions. Geospatial computer techniques involve Geographic Information Systems (GIS), Global Positioning Systems (GPS), computer mapping, and remote sensing. These technologies have led to significant advances in the ways in which geographic information is collected, mapped, analyzed, and integrated in database and decision-making systems. The Department of Geography has excellent technical facilities, including a Geographic Information Systems lab, a remote sensing lab, and a biogeography lab.

Training in geography provides valuable, marketable skills that are in high demand in business, government, and education. Geography majors obtain employment in such diverse fields as geographic information systems, satellite imagery analysis, planning, transportation, marketing, health care, map making, land and water management, recreation, environmental conservation, and teaching. Employment opportunities are especially strong for students obtaining advanced training in geospatial computer techniques, which are used by both human and physical geographers. Undergraduates in the department have the opportunity to work with several local and county agencies while using their geospatial skills to enhance their education and employment prospects.

Options

In addition to fulfilling the requirements of the Curriculum for Liberal Education and the core curricula of the College of Natural Resources, geography majors must also complete 39 hours in geography and related disciplines. Course requirements vary according to the option that a student selects, but all majors must take GEOG 1004, 1014, 1104, 2314 and STAT 3604. Geography offers two options, both of which lead to the B.A. degree.

Those in the **Culture, Regions, and International Development option** must complete 15 hours from human geography classes (GEOG 2034, 2054, 2064, 2134, 3104, 3204, 3214, 3224, 3234, 3364, 4054, 4074, 4204, 4244, 4764, and SPIA 2004), of which at least 9 credits must be at the 3000-4000 levels; 3 credits from classes in geospatial analysis and the environment (GEOG 3114, 3304, 3314, 3404, 4044, 4084, and 4354); and 6 credits from geography or specified cognate electives, of which at least 3 credits must be at the 3000-4000 levels.

Students in the **Geospatial and Environmental Analysis option** must complete at least 6 credits from GIS and mapping courses (GEOG 3314, 4084, 4314, 4324, 4384, and 4844), at least 6 credits from environmental analysis courses (GEOG 3114, 3304, 3404, 4044, and 4354), and an additional 3 credits from either category; 6 credits from human geography classes (GEOG 2034, 2054, 2064, 2134, 3104, 3204, 3214,

3224, 3234, 3464, 4054, 4074, 4204, 4244, and 4764), of which at least 3 credits must be at the 3000-4000 levels; and 3 credits from geography or specified cognate electives.

Minor Requirements

To graduate with a minor in geography, a student must complete 21 hours of geography, including GEOG 1004, 1014, and 1104; 3 hours from GEOG 2314 or 3314; plus an additional 9 hours of geography classes, of which at least 6 hours must be at the 3000-4000 levels.

Satisfactory Progress

To make satisfactory progress towards the geography degree, upon completion of 60 hours, students must have completed 15 hours in geography. Upon completing 90 hours, students must have an in-major GPA of 2.0 or more. Courses for in-major GPA computation include all GEOG courses and SPIA 2004.

Undergraduate Courses (GEOG)

1004: INTRODUCTION TO HUMAN GEOGRAPHY
Introduction to geography as a social science. Development of a conceptual framework for studying and evaluating human-environment relationships. Examination of selected regional and global issues in terms of human and physical attributes of place. (3H,3C) I,II.

1014: WORLD REGIONS
Human and physical patterns of major regions of the world. Concepts and perspectives of geography as a social science; linkages and interdependence of nations and regions. (3H,3C) I,II.

1104: INTRODUCTION TO PHYSICAL GEOGRAPHY
Integrated study of major subsystems of the natural environment of humans: the nature, distribution, and interrelationships of climate, landforms, vegetation, hydrology, and soils. (3H,3C) I,II.

2034: GEOGRAPHY OF GLOBAL CONFLICT
Discussion of geographical dimensions of global conflicts: territorial, environmental, locational, segregational and perceptual. Explains the background to conflicts, documents the current status of conflicts and discusses the different points of view in conflict. Analysis of the Holocaust in Europe, conflicts in Middle East, Northern Ireland, and Central Europe. Topics in the course will change as the geography of global conflict changes. (3H,3C) II.

2054 (IS 2054) (PSCI 2054): INTRODUCTION TO WORLD POLITICS
An introduction to the prevalent methods and theories in the study of world politics. Topics include: historical context of contemporary world politics, global actors and power relations, international conflict and conflict resolution, international systems, interdependence, trade and integration, international law and prospects for global governance. (3H,3C)

2064 (IS 2064) (PSCI 2064): THE GLOBAL ECONOMY AND WORLD POLITICS
An introduction to the interaction of politics and economics, power and wealth, within the world political economy. Topics include: the international financial system, the dynamics and principles of trade, and the role of transnational firms, as well as issues of environmental protection, sustainable development, and the distribution of wealth and power. (3H,3C)

2134: GEOGRAPHY OF THE GLOBAL ECONOMY
Geographical dimensions of the global economy since World War II. Globalization and the emergence of a new international division of labor. The relative decline of the United States and the growth of Japan, East Asia and the European Union. Changing geographies of foreign direct investment location. Places and regions in geo-economic discourse. Population and resources issues in the early twenty-first century. I (3H,3C)

2314: MAPS AND MAPPING
Introduction to mapping and its role in society. Fundamentals of map reading, analysis, and interpretation, as they are required for the solution of spatial problems. Influences of maps on attitudes toward and images of the geographic environment. (3H,3C) II.

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3104: ENVIRONMENTAL PROBLEMS, POPULATION, AND DEVELOPMENT
Environmental problems considered in their social, spatial, and global contexts. Impacts of globalization, political economy, population, culture, and poverty on environmental crises. Examination of effects of relations between developed and developing countries on the environment. Focus on selected key environmental issues, such as population growth, pesticide misuse, the development process and the environment, the energy crisis, and environmental justice. (3H,3C)

3114 (GEOS 3114): INTRODUCTION TO METEOROLOGY
A nonmathematical introduction to meteorology including consideration of the structure of the atmosphere, energy balance in the atmosphere, clouds and precipitation, air masses and fronts, global circulation, storms, climatology, catastrophic weather, meteorological optics, and forecasting. (2H,3L,3C)

3204: GEOGRAPHY OF MIDDLE AMERICA
Assessment of human-environment interactions in the region from earliest human habitation to the present. Includes Pre-Columbian ecological adaptations; change introduced by European conquest and colonization; revolution and land reform; and contemporary geographic case studies. 3 hours of Geography required. (3H,3C) II.

3214: GEOGRAPHY OF AFRICAN DEVELOPMENT
Survey of African habitats, cultures, livelihood systems, and socioeconomic development mainly south of the Sahara. Human adjustments to changing environmental, demographic, economic, and political conditions during the colonial and post-colonial eras. 3 hrs in Geography required. (3H,3C) II.

3224: GEOGRAPHY OF APPALACHIA
Appalachia as a region: physical environment, development of internal settlement, cultural, economic, and political patterns. Human adaptations to environmental change and linkages to external regions. 3 hrs in Geography required. (3H,3C) II.

3234: GEOGRAPHY OF VIRGINIA
Virginia as a region: physical environment, development of settlement, cultural, economic, and political patterns. Human adaptation to environmental change, human modification of environments, and linkages to external regions. 3 hours in Geography required. Writing-intensive course. I (3H,3C)

3244: THE U.S. CITY
The economic, political, and social forces driving urbanization in the United States. The American city in historical context with particular emphasis on the rise of manufacturing, deindustrialization, and suburbanization. Case studies from the manufacturing and sunbelt regions to illuminate key constructs from urban and human geography. "Border" examples of comparative urbanization from the U.S. -Mexican border, the Caribbean, and Canada. Junior standing required. (3H,3C)

3254: GEOGRAPHY OF EAST ASIA
A geographical analysis of several modern states in East Asia, specifically China, Japan and the Koreas. Economic, political, and cultural change since the end of World War II. Globalization and the emergence of the China as a demographic and economic giant. (3H,3C)

3304 (CSES 3304) (GEOS 3304): GEOMORPHOLOGY
Examines the variety of landforms that exist at the earth's surface. Detailed investigation of major processes operating at the earth's surface including: tectonic, weathering, fluvial, coastal, eolian, and glacial processes. Field excursion. Pre: 1104 or GEOS 1004 or GEOS 2104. (3H,3C)

3314: CARTOGRAPHY
Science and art of cartography including the conceptual framework of the cartographic method. Development of the skills necessary to create maps to be used in the analysis of spatial phenomena for geographic research. Emphasis on thematic cartography. I (2H,3L,3C)

3324 (CEE 3324): INTRODUCTION TO APPLIED METEOROLOGY
Course emphasizes the operational aspects of weather prediction and severe storm forecasting. Focus is on surface data analysis, upper air soundings and skew-T diagrams, pressure maps, frontal analysis, atmospheric moisture and its implications for forecasting, Doppler radar and satellite imagery, forecast models, hurricanes, atmospheric instability, convection and thunderstorm life-cycle, forecasting thunderstorm types, tornadoes and severe weather forecasting. (3H,3C)

3404: MOUNTAIN GEOGRAPHY
Physical characteristics of mountains, such as steep slopes, climatic extremes, and sharp environmental gradients, and their influences on the ways in which people, animals, and plants interact. Physical processes that operate in high-relief environments, including consideration of climate, geomorphology and biogeography. Influence of physical processes in mountain environments on human culture and activities. Cultural significance of mountains. Mountains as a resource. Land use and human-land interactions in mountains. Course is intended for students with an interest in what makes mountains unique and inspiring landscape elements. Pre: 1104. (3H,3C)

3464 (AHRM 3464) (EDHL 3464) (HD 3464) (HUM 3464) (SOC 3464) (UAP 3464): APPALACHIAN COMMUNITIES
The concept of community in Appalachia using a multidisciplinary approach and experiential learning. Interrelationships among geographically, culturally, and socially constituted communities, public policy, and human development. 2000-level course in any cross-listing department required. (2H,3L,3C)

3954: STUDY ABROAD
Variable credit course.

4044 (BIOL 4044): BIOGEOGRAPHY
A survey of the field of biogeography. A study of the factors influencing the distribution of plants and animals approached from ecological, historical, and cultural perspectives. Human influence on biotic patterns, such as crop domestication, habitat alteration, species introductions and extinctions, management issues, and environmental change, is a primary focus. Pre: 1104 or BIOL 2804. (3H,3C)

4054: GEOGRAPHY OF WINE
Analysis of physical and cultural forces that shape the production, consumption, and great variety of wine in the world. Wine as a complex commodity is examined through its economic, social, political, and ideological impacts in different parts of the world throughout history. Particular emphasis will be focused on place as an agent in defining the product. (3H,3C)

4074: MEDICAL GEOGRAPHY

Geographic patterns of disease and health care at various scales. Ecological, holistic approach to health problems emphasizes interrelationships of population-habitat-culture. Mapping of disease patterns and health services delivery and utilization. Field experience included. 3 hours of Geography required. I (3H,3C)

4084 (GEOS 4084): INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS
Use of automated systems for geographic data collection, digitization, storage, display and analysis. Basic data in GIS applications. Overview of GIS applications. Group homework projects to develop proficiency in the use of current GIS software. Prior experience with personal computers recommended. (3H,3C)

4204: GEOGRAPHY OF RESOURCES
Environmental problems of Industrialized and Third World. Human impact on the environment, population-resource relationships, the relationship between resources and economic development, food production and the problem of world hunger, and energy-related issues. I (3H,3C)

4244: GEOGRAPHY OF EUROPE
Overview of the physical geography, places, and peoples of Europe, past and present. Evolving cultural landscapes of Europe. Colonial linkages to other regions. Economic globalization and uneven development in the European Union. Comparative intracontinental regional case studies. One GEOG course at 2000 level or above, or consent. (3H,3C) II.

4314: SPATIAL ANALYSIS IN GEOGRAPHIC INFORMATION SYSTEMS
Theory and application of Geographic Information Systems, with special emphasis on analytical operations, database design, cartographic modeling, and raster GIS. Spatial data handling and analysis to facilitate decision-making through the communication of geographically referenced data. Pre: 4084. (2H,3L,3C)

4324: ALGOTRITHMS IN GEOGRAPHIC INFORMATION SYSTEMS
Computational methods in automated mapping and map analysis. Visual Basic programming and algorithm design for spatial display and analysis under both raster and vector data models. Requires regular use of the departmental microcomputer and UNIX workstation laboratory. Variable credit course. Pre: 4084, CS 1044.

4354 (GEOS 4354): INTRODUCTION TO REMOTE SENSING
Theory and methods of remote sensing. Practical exercises in interpretation of aerial photography, satellite, radar, and thermal infrared imagery. Digital analysis, image classification, and evaluation. Applications in earth sciences, hydrology, plant sciences, and land use studies. (2H,3L,3C)

4384: THE ARC/INFO GEOGRAPHIC INFORMATION SYSTEM
Use of the Arc/Info software system for basic data tasks such as database development, digitization, storage, display and analysis under the UNIX operating system. Individual application projects will be developed throughout the semester in consultation with the instructor. I Pre: 4314 or 4324.

4404 (ALS 4404) (NR 4404) (UAP 4404): APPROACHES TO INTERNATIONAL DEVELOPMENT
An introduction to issues relating to international development. The course will focus on areas to help students better understand the interdependencies between countries and how institutions and organizations can foster effective working relationships on global projects of mutual interest between countries. (1H,1C) I.

4764 (SOC 4764) (UAP 4764): INTERNATIONAL DEVELOPMENT POLICY AND PLANNING
Examination of major development theories and contemporary issues and characteristics of low-income societies (industrialization, urbanization, migration, rural poverty, hunger, foreign trade, and debt) that establish contexts for development planning and policy-making. Junior standing required. I (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Natural Resources

Wood Science and Forest Products

www.woodscience.vt.edu/

A. Zink-Sharp, Interim Head
Professors: D.A. Brinberg[1]; R.J. Bush; K.J. Edgar; C.E. Frazier; A.L. Hammett; D.E. Kline; J.R. Loferski; R.L. Smith; P.M. Winistorfer; A. Zink-Sharp
Associate Professor: B.H. Bond; U.K. Buehlmann
Assistant Professors: J.K. Han; D.P. Hindman; H.J. Quesada-Pineda; S. Renneckar; M. Roman
Adjunct Senior Research Scientist: P. A. Araman
Professor Emeritus: W.G. Glasser; G. Ifju; F.A. Woeste[2]; M.S. White; R.L. Youngs
[1] Courtesy Appointment joint with Marketing
[2] Joint Appointment with Biological Systems Engineering

Adhesion Science

This option is rooted in chemistry and introductory polymer science. It prepares students for numerous career tracks which include: the adhesives industry, the wood-based composites industry, and other disciplines in which the unique combination of chemistry, polymer science and wood science hold great value. This option satisfies the requirements for a minor in chemistry.

Forest Products Marketing and Management

This option provides students with an industry-specific background through its combination of business and wood science coursework. There are numerous career opportunities for this option in both the private and public sectors. Employment experiences can include management of wood products manufacturing operations, marketing and sales in the wood products sector, utilization of wood to create innovative products, as well as coordination of international trade to match forest products producers to export market opportunities.

Manufacturing Systems

This option with its industrial engineering and production/operations management coursework provides a solid foundation for individuals seeking to manage wood products manufacturing operations in internationally competitive environments Within this option, students gain interdisciplinary knowledge and skills to drive creative product and process development, to effectively utilize the latest in technological innovations to assure quality in manufactured wood products, and to assure efficient and timely delivery to the customer.

Non-Timber Forest Products (NTFPs)

This option focuses on the socio-economic aspects of the products originating from forests other than industrial timber and how those products can impact the local and national economies of both industrialized and non-industrialized countries. Career opportunities are global and range from technical assistance to support sustainable use, management, and development of NTFPs to consulting assistance to find markets and develop management plans for NTFPs.

Packaging Science

Significant opportunities exist to improve the efficiency and safety of the global unit load logistics system of product storage and distribution by understanding how critical components in the system interact during use. Graduates of this option will be unique in the industry with an understanding of transport packaging and unit load systems-based design technologies, which include the interactions of packaging, pallets, and unit load material handling equipment. Interdisciplinary education and research will include all components of the unit load logistics system, including packaging design, pallet design, unit load stabilization, dunnage, blocking, and bracing, unit load handling equipment design, and

associated interactions, and includes courses in wood science and forest products, industrial and systems engineering, material science engineering, and graphic arts.

Wood Structures and Materials

This option focuses on the study and development of better ways to use wood in buildings. The principles of engineering and physics are used to help designers and builders produce economical and durable buildings and structures. With the invention of modern wood-based composites such as oriented strand board, laminated veneer lumber, and parallel strand lumber, new possibilities for building construction are being explored and developed. The industry needs people who understand the unique engineering properties of wood and wood-based composites so that new products can be developed and that existing products are used in the proper way.

Wood Science minor and Packaging Science minor

Minors are offered for students interested in obtaining knowledge and skills in the wood science field to supplement their primary major field of study.

Course Descriptions (WOOD)

1234: INTRODUCTION TO WOOD SCIENCE AND FOREST PRODUCTS
Wood as a material. Introduction to laboratory techniques, wood processing, machining and woodworking, moisture interactions, species characteristics, microscopic techniques, measuring material properties, characteristics of forest products industry, career opportunities. (1H,3L,2C)

2104: PRINCIPLES OF PACKAGING
Packaging systems, materials, and forms and their relationship with the requirements of global societies for the distribution and storage of industrial and consumer products; packaging laws and regulations. I (3H,3C)

2124: WOOD STRUCTURE AND PROPERTIES
Macroscopic and microscopic structure and chemical composition of wood. Identification of commercially important woods. Impact of structure on physical and mechanical properties of wood. Principles of wood processing, including sawmilling, veneering, composite boards, paper. Description of the wood products industry including the products manufactured, the raw material requirements for each product, and the processing procedures. (2H,3L,3C)

2554: WOOD MATERIALS SCIENCE AND TECHNIQUES
Introduction to the basic materials science of wood, and to the common analytical techniques for characterizing and testing wood. Scientific measurements and data collection. Wood thermal properties. Mass transport in wood. Water and wood equilibria. Wood electrical properties. Wood microscopy and digital image analysis. Material property testing. Pre: 1234. (1H,3L,2C)

2614: INTRO FOREST PROD MARKETING
Study of marketing systems and methods used by North American primary and secondary forest product industries. Emphasis on wood product industries. Marketing of hardwood lumber, softwood lumber, panels, composites, furniture, and paper products. Role of North American industries and markets in world trade of forest products. (3H,3C)

2784 (FOR 2784): WORLD FORESTS AND FOREST PRODUCTS
A socio-economic approach to examining the management and use of the world's forests, enhance knowledge of global forest resources and products, and understand the roles and relationships of key stakeholders. Sophomore standing. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3124: PAPER AND PAPERBOARD PACKAGING
Paper and paperboard properties and types. Types and performance of flexible paper packaging, sacks, and wraps. Folding carton design, properties of corrugated fiberboard. Corrugated fiberboard container design and performance. Packaging regulations and hazards of the distribution environment. Printing, labeling and automatic identification methods. Pre: 2124, 3434. (2H,3L,3C)

3224: PACKAGING AND MATERIALS HANDLING
Unit load and parcel supply chains. Principles of operation and design of warehouse distribution and fulfillment centers. Principles of operation and design of shipping and distribution systems. The relation between packaging design, pallet design, and unit load design and the operation of industrial consumer goods supply chain. Pre: 2104. (3H,3C)

3234: WOOD IDENTIFICATION PROPERTIES LABORATORY
Physical properties and characteristics of wood. Methods for determining its physical properties. Variation of the properties. Structure, properties, & processing of tropical woods. I (3L,1C)

3314: WOOD MECHANICS
Mechanical properties of wood including concepts of stress, strain, Poisson's ratio, orthotropic properties, tension, compression, bending and effects of moisture on mechanical properties. Current issues of wood mechanics in the wood product industry. Standard methods of evaluating important mechanical properties or solid wood, composites and fiber. Pre: 2554, MATH 1016. (3H,3L,4C)

3334: SURVEY OF NON-TIMBER FOREST PRODUCTS
In depth study of non-timber forest products of NTFP throughout Appalachia with overseas example – their heritage, uses and markets, economic development opportunities, and sustainable management. Emphasis will be placed on utilization and management issues. Students will gain skills necessary to assess and plan for NTFP business opportunities. (3H,3C)

3434: WOOD CHEMISTRY, PRODUCTS AND PROCESSES
Chemistry of structural wood components, polysaccharides, lignin, and extractives. Principles of industrial wood processes that involve chemical technology: pulping, bleaching and papermaking. Products derived from wood by chemical processes. Pre: 2114, CHEM 2514. (3H,3C) II.

3534: LUMBER MANUFACTURING AND DRYING
The processing of logs into dry lumber. Principles of log and lumber grading. Design and operation of log sawing and lumber drying systems. Techniques for measuring lumber manufacturing and lumber drying efficiency. The relationship between log quality, sawing, and drying and the quality of the product produced. Pre: 3114. (2H,3L,3C)

3544: SECONDARY WOOD PRODUCTS MANUFACTURING
Secondary wood products manufacturing, including raw materials, rough mill, finish mill, assembly, and finishing. Also covers machinery, wood machining, plant layout, production methods, modern industrial engineering concepts in secondary manufacturing, and wood treating. Visits to local secondary wood products manufacturing industry. Pre: 3114, 3534. (2H,3L,3C)

3954: STUDY ABROAD
Variable credit course.

3964: FIELD STUDY
Variable credit course.

4004: SENIOR SEMINAR IN FOREST PRODUCTS MARKETING AND MANAGEMENT
Integrated application of principles of management and marketing. This capstone class will develop skills in business planning and decision making for future managers in the forest products industry. Senior standing required. (1H,1C)

4024: PACKAGING DYNAMICS FOR DISTRIBUTION
Understanding, identification, and measurement of hazards in physical distribution. Design and analysis of packaging protection against such hazards as shock, vibration, compression, and climate. Includes laboratory tests of shock, vibration and compression, and performance testing of packaging and components. Pre: 3224. (2H,3L,3C)

4154: COMPUTER APPLICATION SYSTEMS IN FOREST PRODUCTS
Computer control systems with applications in the forest products industry. Survey of systems for gathering, inputting, conditioning, and managing information. Hardware and software systems for computer control applications. Use of information technologies to integrate control subject to raw material, quality, and market fluctuations. Forest products case studies in data acquisition, data analysis, database management production planning, process control, inventory control, and systems specification. Junior standing is required. (2H,3L,3C)

4224: WOOD PALLET, CONTAINER, AND UNIT LOAD DESIGN
Wood pallet design and performance. The design of wood containers and crates. Design and performance of unit loads. Design and performance of unit load equipment, i.e., conveyors, racking systems, automatic guided vehicles, fork trucks. Principles of unit load design. Mechanical interactions between pallets, packaging, and unit load handling equipment. Unit load stabilization techniques, i.e., strapping, stretch wrapping. International phytosanitation regulations of solid wood packaging; principles of dunnage, blocking and bracing. Pre: 3534, 4124, 4315. (2H,3L,3C)

4444: WOOD-BASED COMPOSITE MATERIALS
Introductory polymer, adhesion, and materials science of wood-based composites. Manufacture, performance, and testing of particulate, strand, and veneer-based composites, including wood-thermoplastic composites. Contemporary wood adhesions, binders, and matrices. Pre: 2124, 3314, 3434. (3H,3L,4C)

4445-4446: WOOD ADHESION AND COMPOSITES
Introductory polymer science and surface chemistry. Fundamentals of adhesion and fracture in adhesively bonded wood. Industrially significant adhesive systems used for bonding wood with emphasis on wood-based composites. Introduction to wood coatings, formulation, application and weather durability. 4446: Processing of wood-based composites, product design and performance; product testing and standards. Pre: 3434 for 4445; 4445 for 4446. (2H,3L,3C)

4514: WOOD PRODUCTS INDUSTRY STUDIES
Field studies of the processing systems and product manufacturing procedures of various wood products industries. I Pre: 3114. (3L,1C)

4624: WOOD INDUSTRY PRODUCTION OPERATIONS MANAGEMENT
Study of the operation of wood products organizations. Problems facing these organizations and current management practices used to address these problems. Investigation of the design and implementation of wood industry management improvement efforts. How organizations and groups design, implement, and evaluate improvements efforts. The application of techniques to production planning, financial management, inventory management, quality, human resources management, technology, performance measures, and assessment. Includes case studies of wood products manufacturing companies. Pre: 3544. (2H,3L,3C)

4634: FOREST PRODUCTS BUSINESS MANAGEMENT
This course will describe the allocation of resources within a forest products business. Students will determine how to allocate natural, human and financial resources to maximize profitability within the organization. How allocation decisions affect all stakeholders of the organization will be demonstrated and this allocation's impact upon strategic planning will be discussed. The course will also show the impact of the external business environment on management decisions. Pre: 1234, 2614, 3114. (3H,3C)

4714: WOOD PERFORMANCE IN CONSTRUCTION
Interactions of building code requirements, wood materials and building construction with special emphasis on relative merit of wood and wood-based composites versus non-wood alternatives. Construction details that lead to long-term performance such as controlling moisture infiltration, preservatives, and proper selection of materials, preservation of historic wood buildings, effectiveness and efficiency of wood building systems. Pre: 4315. (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

www.pamplin.vt.edu/

Richard E. Sorensen, Dean
Associate Dean for Administration: Kay P. Hunnings
Associate Dean for Graduate Programs: Stephen Skripak
Associate Dean for Research: Kent Nakamoto
Associate Dean for Undergraduate Programs: Candice E. Clemenz

Overview

Virginia's largest undergraduate business school, Pamplin College of Business is committed to outstanding teaching by full-time faculty who are nationally recognized in theoretical and applied research. The Pamplin College is further committed to being known for its graduate programs throughout the Commonwealth, and to serving business and society through the expertise of its faculty, alumni, and students. Dean Richard E. Sorensen has said, "The Pamplin College, as a center for excellence, is an academic generator of high quality applied and theoretical research that translates into teaching superiority and practitioner applications for all its audiences."

Our emphasis is on: Enhancing the high quality of our undergraduate programs; providing a high quality MBA program at locations throughout the Commonwealth; raising the research and scholarship reputation of the faculty; integrating the computer and technology into the academic curriculum; developing the leadership skills and ethical values of our students; preparing students for global business challenges, including providing opportunities for global experience before graduation; enhancing our commitment to diversity; heightening our level of service to the business community through the research and expertise of faculty, students, and graduates; and enhancing the quality of the Ph.D. program.

The college regards diversity as a source of strength and pride. Building upon this commitment, the college affirms the following principles:

- All students, regardless of their background (race, color, gender, sexual orientation, disability, age, veteran status, national origin, religion, or political affiliation), deserve and are promised equal opportunity to an education in the Pamplin College of Business.
- We support an environment for students, faculty, and staff that is free from hostility and intolerance.
- We pursue a supportive and diverse community that respects each individual, and allows ideas and opinions to be openly discussed.
- The Pamplin College is committed to the goal of developing its students, faculty, and staff in a manner that inspires them to successful participation and effective leadership in a pluralistic society, and considers these values essential to that goal.

The curriculum includes a broad liberal education foundation of two years, followed by a college core in the fundamentals of business theory and, finally, concentration in the major.

The college offers majors in:

- Accounting and Information Systems
- Business Information Technology
- Economics
- Finance
- Hospitality and Tourism Management
- Management
- Marketing

Academic advising in the college parallels the two layers of the curriculum. Through the sophomore year, all students are advised in the Business Advising Center, 1046 Pamplin Hall. Following students' clearance for upper-division course work and their declarations of their majors, students are assigned faculty advisors from their majors.

Undergraduates are strongly encouraged to participate in the out-of-class activities of the college, particularly the annual career fair in September; the placement seminars, and registration meetings held each semester; the ethics and leadership seminars; college international programs and study abroad; and the various events of the 27 different student clubs in the college. These programs provide critical insights into the careers for which students are preparing and valuable opportunities for leadership.

Undergraduates are required to purchase a personal computer. The PC is used extensively in the curriculum. Purchase information and required configuration will be available each spring.

Administrative and faculty offices for the college are located in Pamplin and Wallace Halls. Our facilities also include study rooms, computer labs, conference rooms, a behavioral laboratory, an atrium, and a student organization office center.

The college is a member of The Association to Advance Collegiate Schools of Business, AACSB International. All programs are accredited by the AACSB.

General Requirements for Graduation

A minimum of 125 semester hours is required for graduation in each curriculum.

The student must have an overall average GPA of 2.0 ("C") on all work attempted and in the courses in the major.

To ensure credit, a student desiring to take courses at another institution must secure approval of the associate dean for undergraduate programs of the Pamplin College before registering for the course at the other institution.

Acceptance of work completed at junior or community colleges is limited to those courses offered at the freshman-sophomore level at Tech. General university limitations on acceptability of transfer credit are shown elsewhere in this catalog.

Program for First Two Years

All students in business generally take the same required courses for the first two years. A major within the college may be selected at any time during the first two years, but must be selected by the end of the semester in which the student attempts 72 semester hours. Because Economics is an unrestricted major within the College of Business, students in ECON who did not enter the university as BUS or ECON, must apply if they wish to change into ACIS, BIT, FIN, HTM, MGT, and MKTG.

Students must have a GPA of 2.0 or better in the combined series in accounting and information systems, business information technology, economics, and mathematics with no grade less than C- in the nine designated courses in these departments; have an overall GPA of 2.0 or better for all course work; and have earned at least 60 semester hours before enrolling in junior business courses.

Requirements for the first two years

	Hours	
ACIS 1504 Introduction to Business Information Systems	3	First Year
ENGL 1105-1106 Freshman English or COMM 1015-1016 Communication Skills	6	First Year
MATH 1525-1526 Calculus with Matrices	6	First Year
Scientific Reasoning and Discovery [1]	8	First Year
Social Sciences [2] Must include PSYC 2004 Introductory Psychology or SOC 1004 Introductory Sociology	9	First or Second Year

Area 2 - Ideas, Cultural Traditions, and Values [3]	6	First or Second Year
ACIS 2115-2116 Principles of Accounting	6	Second Year
BIT 2405-2406 Quantitative Methods	6	Second Year
ECON 2005-2006 Principles of Economics [4]	6	Second Year
COMM 2004: Public Speaking or free elective [5] if COMM1015-1016 are taken in the first year	3	Second Year
Free Elective and/or Major Requirement [5]	6	Second Year
	65	

[1] Students select any science in Area 4 of the Curriculum for Liberal Education. Only students majoring in Economics are required to take a laboratory. All other students may take the laboratory or two hours of any free elective.
[2] For the other social science courses student select from any courses in Economics (beyond Principles), Geography, History (except HIST 1024, 1025, 1026, or 2054), International Studies, Political Science (except PSCI 3015-3016), Psychology, and Sociology; or any course approved for Area 3 of the Curriculum for Liberal Education. Some social science courses, such at GEOG 1014, HIST 1214, IS 2055, PSCI 1024, and SPIA 1004 will also satisfy Area 7.
[3] Any six semester hours in Area 2 of the Curriculum for Liberal Education.
[4] These two required courses will complete Area 3 of the Curriculum for Liberal Education.
[5] Free Electives during the sophomore, junior, and senior year must include at least one hour from the Curriculum for Liberal Education Area 6: Creativity and Aesthetic Experience. The Curriculum for Liberal Education Area 7: Critical Issues in A Global Context, may be used to meet another requirement or taken as a free elective.

College Requirements for Second Two Years

Regardless of major selected, the following core courses are required of all business students:

BIT 3414: Production and Operations Management	(3)
FIN 3055: Legal Environment of Business	(3)
FIN 3104: Introduction to Finance	(3)
MGT 3304: Management Theory and Leadership Practice	(3)
MKTG 3104: Marketing Management	(3)
MGT 4394: Business Policy and Strategy	(3)

The remaining hours to complete the required 125 credit hours are made up of in-major requirements and free electives. At least 50 percent of the hours completed for the degree must be taken outside the college, except except for the ACIS major that requires 40% of classes to be taken outside of the college.

Center for Leadership Studies and Leadership Minors

The Center for Leadership Studies coordinates leadership programs across campus including the Corps of Cadets Center for Leader Development, the Department of Management's Business Leadership Center, and other leadership activities organized by the Pamplin College of Business, Student Affairs, and Interdisciplinary Studies. Currently, the college administers two minors: the Virginia Tech Corps of Cadets minor in leadership studies and the Department of Management Business Leadership minor.

For more information on the 18-credit Corps of Cadets minor in leadership, see the material in the ROTC section of the catalog or contact the Center for Leader Development, 540/231-7136.

The 18-credit Business Leadership minor is open to students in all majors who have at least a 2.50 overall GPA at Virginia Tech. It includes required courses in management theory and leadership practice, ethical leadership and corporate social responsibility, and advanced skills in leadership; elective courses from business, communication, humanities, and sociology; and a required leadership experiential activity. For additional information, contact Dr. James R. Lang, Director, Business Leadership Center, 540/231-2604.

Global Business Minor

Sophomores, juniors, and seniors in the Pamplin College who have at least a 2.0 overall GPA are eligible for the Global Business minor of 18 semester hours of course work and an international experience. The required course work includes: three courses from BIT 4474, Global Operations and Information Technology; ECON 4135, 4136; International Economics: Finance; FIN 4144, International Financial Management; MGT 4314, International Management; and MKTG 4704, International Marketing; as well as nine additional semester hours from a list of international courses in five colleges, one of which must be in foreign languages if at least three years of a foreign language were

not passed in high school. The required international experience may be met with study abroad, international internships, co-op assignments at multinational corporations, and living abroad. To facilitate the international experience requirement, Pamplin offers summer study abroad trips which generally involve six semester hours of credit toward the degree and minor, as well as semester-long study abroad programs. Applications for this minor are available in 1046 Pamplin Hall.

Minor in Business

Students with majors outside Pamplin may apply for a minor in business if they have competitive grades in required courses, a minimum 2.0 overall GPA on at least 24 semester hours at Virginia Tech, if they have completed Math 1525-1526 or its equivalent, and if they have at least a C- in any ACIS, BIT, ECON, FIN, MGT, or MKTG, course which they have taken. The minor consists of 27 semester hours of lower division course work which must be successfully completed before taking the 15 semester hours of upper division courses. Applications are available in 1046 Pamplin.

The lower division requirements are ACIS 1504, Introduction to Business Information Systems; ACIS 2115-16, Principles of Accounting; BIT 2405-06, Quantitative Methods; ECON 2005-2006, Principles of Economics; and MATH 1525-26, Calculus with Matrices, and the upper division courses are: BIT 3414, Production and Operations Management, or BIT 4414, Service Operations Management; FIN 3055, Legal Environment of Business; FIN 3104, Introduction to Finance; MGT 3304, Management Theory and Leadership Practice; and MKTG 3104, Marketing Management. In order to complete the minor in business, students must have a 2.0 GPA in the 15 semester hours of upper division courses.

Real Estate Minor

Sophomores, juniors, and seniors in any major with at least a 2.0 overall GPA and with a 2.0 average in any real estate minor courses already taken may apply for a real estate minor. Coordinated in Pamplin, this minor of 19 semester hours includes courses from five different colleges and is administered by a steering committee of faculty from those colleges. The 13 semester hours of required courses include: AAEC 4754 and 4764, Real Estate Law and Real Estate Appraisal; FIN 4154, Real Estate Finance or MKTG 4734, Real Estate Marketing; and UAP 4744, Principles of Real Estate (4 sem. hours). The additional two courses may be taken from a list of nine designated electives in AAEC, AHRM, BC, FIN, MKTG, and UAP. Pamplin College of Business students in the minor must take both FIN 4154 and MKTG 4734, and select one additional course. Applications are available in 1046 Pamplin Hall.

Business Diversity Minor

The 18 credit Business Diversity Minor is open to students in all majors across the campus. This minor will help students understand the organizations in which they will work and the world in which they will live. It includes required courses in Management and additional course choices from Marketing Management, Hospitality & Tourism Management, Finance, and electives from 12 different departments across campus. In order to develop diversity-related awareness, knowledge, and skills, students are required to participate in a diversity-related internship or field study. To apply, students may obtain an application from 1046 Pamplin or on-line at www.diversity.pamplin.vt.edu. For more information, please contact Dr. Mary Connerley at maryc@vt.edu or 540-231-7372.

Cooperative Education Programs in Business

The college participates in the Cooperative Education Program in which qualified students may alternate semesters of study in the major with semesters of professional employment. Additional information pertaining to the program is included in the "Academics" section of this catalog.

Graduate Programs in Business

Graduate instruction and opportunities for research are offered to students who have bachelor's degrees from accredited colleges. The college offers the Master's of Business Administration, and master's and Ph.D. degrees in all departments. All graduate students are required to attain a satisfactory score on the Graduate Management Admission Test (GMAT).

Preparation for Law

The four-year course leading to the B.S. degree in any major in the college provides a sound preparation for law school, and pre-law advisors from the Pamplin faculty are provided.

Economics

Economics is offered as a major through both the Pamplin College of Business and the College of Science. Both an honors degree and a minor in economics are also offered in the College of Science. Students in either college take the same economics courses, but the college core requirements differ.

For economics faculty and course descriptions, visit Economics in the College of Science.

Pamplin College of Business

Accounting and Information Systems

www.acis.pamplin.vt.edu/

Robert M. Brown, Head
KPMG Professor of Accounting and Information Systems: L. N. Killough
R. B. Pamplin Professor of Accounting and Information Systems: R. M. Brown; W. E. Seago
John E. Peterson, Jr. Professor of Accounting and Information Systems: C. B. Cloyd
John F. Carroll, Jr. Professor of Accounting and Information Systems: J. J. Maher
Professors: F. Belanger; J. O. Hicks; T. K. Sen
Associate Professors: R. Barkhi; S. Bhattacharjee; J. A. Brozovsky; W. Fan; S. A. Hicks; J. G. Jenkins; D. A. Salbador; S. D. Sheetz; D. P. Tegarden; L. G. Wallace; J. A. Yardley
Assistant Professors: M. J. Oler; V. Popova; L. I. Wood
Instructors: C. M. Easterwood; M. T. Griffin; A. D. Harris; J. M. Lacoste
Career Advisor: R. M. Brown (231-6591)

Our Mission

The Department of Accounting and Information Systems in the Pamplin College of Business strives for excellence in fulfilling the three missions of a comprehensive land grant university by:

- Improving the accounting and information systems professions by conducting quality research and disseminating the results;
- Providing a world class accounting and information systems education to our students; and
- Delivering outreach services to accounting and information systems professionals and educators.

The department seeks to fulfill the teaching mission through programs which include:

Undergraduate Programs, where we seek to

- *Prepare students to enter the accounting and information systems professions with the skills and knowledge of business, information systems, and accounting concepts and practices.*

Masters of Accounting and Information Systems, where we seek to

- *Prepare students for professional careers with specializations in taxation, information systems, audit, and financial services.*

Ph.D. Program in Business with a major in Accounting and Information Systems, where we seek to

- *Prepare students for academic careers in research and teaching.*

The Department of Accounting and Information Systems prepares students to become professionals in their chosen area of accounting and information systems. Faculty members in the department have chosen to specialize in selected areas of accounting or information systems and they teach and conduct research in these areas. All faculty members at the professorial ranks have Ph.D.s in accounting or information systems appropriate to the courses they teach, and many have professional certification in their areas of specialization. This faculty is committed to the education of accounting and information systems professionals who will be active participants in this information age.

The department's undergraduate program offers three options: Accounting (ACCT), Information Systems Audit (ISA), and Information Systems (ISO). These options are designed to allow students to specialize in their area of interest. Completion of the selected option prepares the student for entry level positions as professional accountants or information systems professionals who work in professional service firms, industrial companies, governmental entitites, or to continue their education in graduate school. The job titles vary greatly and include auditor,

information systems auditor, programmer analyst, management accountant, tax preparer, systems consultant, systems analyst, controller, and cost analyst. The demand for our graduates has been strong throughout the department's history, and that demand is continuing.

Many graduates of our department desire to gain certification in their selected area of specialization. The Certified Public Accountant (CPA) is the best known of these certifications. Students taking the CPA exam in Virginia have to meet a 150-hour requirement in order to sit for the CPA exam. The requirements for other states vary; however, most now or soon will require students to meet the 150-hour educational requirement. Students should discuss with their advisor the several options Virginia Tech provides for meeting this requirement at both the undergraduate and graduate level. In addition to the CPA exam, graduates of our programs sit for the Certificate in Management Accounting (CMA) exam, the Certified Internal Auditor (CIA) exam, the Certified Information Systems Auditor (CISA) exam, and others. Students planning to take one of these exams are advised to talk to their advisor during their junior year so that they may select the electives appropriate for the selected exam.

The department encourages its students to gain "real world" **experience** prior to graduation through a summer internship or by participating in the Cooperative Education Program. More information about these programs is available either from the department's faculty or Career Services.

The department also encourages **interaction with accounting and information systems professionals** by sponsoring three student organizations: Accounting Society; National Association of Black Accountants; and Beta Alpha Psi, the national honorary and professional society dedicated to the advancement of the accounting profession. These organizations and other campus groups provide multiple opportunities for developing leadership skills and interacting with accounting and information systems professionals.

The department encourages students to gain a **global perspective** of business through modules on international issues in our courses by our participation in the college's Global Business Concentration and study abroad programs. Our goal is to encourage our students to become well-rounded professionals who will become leaders in their chosen careers.

Lastly, the department's over 6,000 alumni have generously contributed to a variety of scholarships for accounting and information systems majors. Each year the department awards over $150,000 in scholarships and awards to our students.

Course Requirements

Students graduating from the Department of Accounting and Information Systems **must have a minimum** quality credit average (GPA) of 2.00 in upper-division (3000 and 4000 level) accounting and information systems courses (the *in-major GPA*) as well as an overall GPA of 2.00 for all courses taken at Virginia Tech.

During their sophomore year, students must select one of the three options in the department: Accounting (ACCT), Information Systems Audit (ISA), and Information Systems (ISO). These options are more fully described below.

Accounting Option (ACCT)

The Accounting option provides basic education for careers as internal auditors or tax consultants, large and small corporations (controller's staff), governments (federal, state, and local) and their agencies, and nonprofit organizations. Graduates from this option are prepared to become CMAs, CIA, and all of the other common professional accounting designations. Many of the students who select this option will continue to the Master of Accounting and Information Systems program.

The **Accounting Option (ACCT)** requires the following ACIS courses:

ACIS 1504: Introduction to Business Information Systems	(3)
ACIS 2115, 2116: Principles of Accounting	(6)
ACIS 2504: Personal Computers in Business	(3)
ACIS 3115-3116: Intermediate Financial Accounting	(6)
ACIS 3314: Tax Impact on Decisions	(3)
ACIS 3414: Auditing, Governance and Professional Ethics	(3)
ACIS 3504: Accounting Systems and Controls	(3)
ACIS 4114: Advanced Financial Accounting	(3)
ACIS 4214: Cost Planning and Control	(3)
ACIS 4314: Principles of Taxation	(3)
ACIS 4414: Financial Statement Auditing	(3)
ACIS 4504: Accounting Application Development	(3)

Information Systems Audit Option (ISA)

The IS Audit option is designed to prepare students for careers as information systems auditors and information systems professionals in the areas of enterprise risk assurance services, computer risk management services, and other systems assurance services. These positions are available in organizations from all sectors of business: industry, professional service firms, consulting firms, government, and nonprofit organizations. This track prepares graduates to sit for the CIA, CISA, or other professional designations. The ACIS courses required in the IS Audit option are:

ACIS 1504: Introduction to Business Information Systems	(3)
ACIS 2115-2116: Principles of Accounting	(6)
ACIS 2504: Personal Computers in Business	(3)
ACIS 3115: Intermediate Financial Accounting	(3)
ACIS 3414: Auditing, Governance, and Professional Ethics	(3)
ACIS 3515: Information Systems Development	(3)
ACIS Electives	(6)
ACIS 4024: Information Systems Audit and Control	(3)
ACIS 4414: Financial Statement Auditing	(3)
ACIS 4514: Database Management Systems	(3)
ACIS 4554: Networks and Telecommunications in Business	(3)
ACIS 4684: Information Systems Security and Assurance	(3)

Information Systems Option (ISO)

The Information Systems option (ISO) is designed to be flexible, thus allowing the student to focus on different areas of information systems. The flexibility is provided through the 12 hours of ACIS electives required in the program. Depending upon the electives selected, the student is prepared for careers as systems analysts, programmer analyst, database administrators, systems developers, and other information systems professionals. These positions are available with organizations from all sectors of business: industry, professional service firms, consulting firms, government, and nonprofit organizations. This option does not prepare graduates to sit for the CPA, CMA, or other traditional accounting designations.

The ACIS courses required in the Information Systems option are:

ACIS 1504: Introduction to Business Information Systems	(3)
ACIS 2115-2116: Principles of Accounting	(6)
ACIS 3515-3516: Information Systems Development	(6)
ACIS 3564: Management Information Systems	(3)
ACIS 4514: Database Management Systems	(3)
ACIS 4524: Applied Software Development Project	(3)
ACIS 4554: Networks and Telecommunications in Business	(3)
ACIS Electives	(12)

Note: CS 1054 Introduction to Programming in JAVA is required and should be taken during the Sophomore year.

Undergraduate Course Descriptions (ACIS)

1504: INTRODUCTION TO BUSINESS INFORMATION SYSTEMS
This course provides and overview of business information systems and the software, hardware and data resources used by business organizations. Included is the development, integration and application of information systems components to solving business problems. Information systems security is discussed with emphasis on the role of the end user in making a system secure. Several common end-user software applications are introduced. (3H,3C)

1614 (BIT 1614) (CS 1614): INTRODUCTION TO LIVING IN THE KNOWLEDGE SOCIETY (LIKES)
Introduces computing concepts needed by students to live in the emerging Knowledge Society. Prepares students to take courses in the Curriculum for Liberal education that are part of the pathway with theme Living in the KnowlEdge Society (LIKES)- i.e., the LIKES themed core. Surveys key paradigms of computing, including problem solving, programming, modeling and simulation, and software engineering. Relates these to the Knowledge Society covering data, information, and knowledge, considering hypermedia, human-computer interactions, presentation, visualization, networking, and communication. Students are prepared to understand the (potential) application of computing to society in general and in their disciplines. (1H,1C)

2004: SURVEY OF ACCOUNTING
The fundamental concepts of financial and managerial accounting. Offered to students not enrolled in the College of Business. (3H,3C)

2115-2116: PRINCIPLES OF ACCOUNTING
Comprehensive presentation of basic principles of financial and managerial accounting including origin, purpose, and effect with emphasis on application. Sophomore standing required. (3H,3C)

2504: PERSONAL COMPUTERS IN BUSINESS
Focuses on the design and implementation of spreadsheet projects that support advanced decision-making and problem-solving techniques for professionals and individual business users. An introduction to programming logic is included to allow students to augment and automate spreadsheets. Students enrolling in this course are expected to be familiar with basic spreadsheet skills including spreadsheet navigation, managing multiple worksheets, formatting, formulas, and cell references. Pre: 1504. (3H,3C)

2954: BUSINESS STUDY ABROAD
This course provides students with an international business experience. The course examines the accounting and information systems issues that impact the multinational business. It is only offered as part of a program outside of
the United States. Students will learn from the structured educational experience developed by the faculty leader. Content will vary between semesters.
Pre: Instructor's consent and the completion of 24 semester hours with a minimum GPA of 3.0 or departmental consent. May be repeated for a maximum of 9 credit hours. Variable credit course.

3115-3116: INTERMEDIATE FINANCIAL ACCOUNTING
In-depth analysis of basic concepts of external financial reporting. Includes transaction analysis and preparation of financial statements. Pre: 2115 for 3115; 3115 for 3116. Co: 2504 for 3115. (3H,3C)

3314: TAX IMPACT ON DECISIONS
An analysis of the impact of taxation on business and investment decisions, and the importance of effective tax planning. The course develops a conceptual framework that integrates tax and non-tax factors into decision models. Topics to be covered include basic tax planning strategies, tax policy, an overview of basic tax concepts and terminology, implicit taxes and tax clientele theory, choosing the optimal organizational form, multilateral tax planning in contexts such as executive compensation, and multi-jurisdictional tax issues. Pre: 2116.
(3H,3C)

3414: AUDITING, GOVERNANCE, AND PROFESSIONAL ETHICS
The purpose of this course is to introduce the accounting student to the interrelationships between auditing and corporate governance with an emphasis on the societal role of auditing, internal control and professional ethics. Enrollment limited to ACIS majors or with permission of instructor. Pre: 3115, (3504 or 3515). (3H,3C)

3504: ACCOUNTING SYSTEMS AND CONTROLS
Examines system design concepts and methods including an understanding of basic control structures. Covers specific accounting cycles and computerized transaction processing systems. Analyzes controls for manual and computerized
systems including database systems. Pre: 2116. Co: 2504. (3H,3C)

3515-3516: INFORMATION SYSTEMS DEVELOPMENT
Study of the strategies and techniques for dealing with the inherent complexity in the development of information systems. Includes coverage of business systems planning; fact-finding and requirements analysis techniques; information systems modeling; logical and physical design; input and output design; user interface design; software construction and testing; software configuration management; and software quality assurance. Upper division clearance required. Pre: 1504, CS 1054 for 3515; 3515 for 3516. (3H,3C)

3524: APPLICATIONS PROGRAM DEVELOPMENT
Emphasis on structured methodology of program design, development, testing, implementation, and documentation of common business-oriented applications. Includes coverage of sequential, indexed sequential, and random access files, and processing techniques and development of programs and systems of programs for batch and interactive environments. Pre: CS 1054. (3H,3C)

3534: ACCOUNTING INFORMATION SYSTEMS DEVELOPMENT
Development of menu-driven accounting application software using database software. Emphasis is placed on understanding and programming various accounting subsystems such as inventory and accounts receivable, as well as the interface of these subsystems with the general ledger process. Appropriate editing, validation, and security techniques are incorporated into the system design to ensure data integrity. Coverage is provided of various commercial software packages including general ledger. Pre: 2116, CS 1054. (3H,3C)

3544 (BIT 3544): MANAGEMENT OF INFORMATION SYSTEMS AND TECHNOLOGIES
The course provides the necessary background to enable management information systems personnel to understand tradeoffs in information systems hardware, software, and architecture for effective use in the business environment. Topics covered include information technology planning and strategy, trends in computer hardware and systems software, telecommunications and network management, control and management of information resources, distributed and client- server technologies, and data representation and visualization. Partially duplicates CS 1104. Pre: BIT 3444 or CS 1054. (3H,3C)

3564: MANAGEMENT INFORMATION SYSTEMS
An overview of management information systems. Topics include the organizational foundations of information systems; the technical foundations of information systems; the approaches to building information systems; and the management of contemporary information systems. Pre: 1504, 2115, 2116. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4024: INFORMATION SYSTEMS AUDIT AND CONTROL
An introduction to the fundamentals of information systems auditing. Emphasis on information systems controls, types of information systems audits, and concepts and techniques used in information systems audits. Exposure to risk assessment and professional standards in the field of information systems auditing. Pre: 3504 or 3515. (3H,3C)

4114: ADVANCED FINANCIAL ACCOUNTING
A continuation of a detailed analysis of the concepts of external financial reporting begun in 3115 and 3116. Includes transaction analysis and preparation of financial statements. Pre: 3116. (3H,3C)

4124: GOVERNMENTAL AND NONPROFIT ACCOUNTING
An analysis of the environment and characteristics of government and nonprofit organizations, and an in-depth study of basic concepts and standards of financial reporting for such entities. Pre: 3115. (3H,3C)

4194: ANALYSIS OF FINANCIAL STATEMENTS
Provide theoretical background and tools necessary to analyze financial statements from the perspective of making valuation and investment decisions. The focus of the course is on the use of accounting information in making these decisions. Pre: 3116 or FIN 3134. (3H,3C)

4214: COST PLANNING AND CONTROL
The purpose of this course is to help the student develop an understanding of the role of accounting in the management process, an understanding of cost accounting systems, an understanding of cost behavior, an understanding of alternative accounting systems, and the usefulness of costs involved in non-routine decision-making. Pre: 2116, 2504. (3H,3C)

4314: PRINCIPLES OF TAXATION
Survey of basic concepts of federal income taxation that are common to all types of taxpayers (i.e. individuals, corporations, and flow-through entities). Topics to be covered include tax policy objectives, tax accounting methods that affect the timing of income and expense recognition, concepts of gross income and trade or business expenses, income character, and tax issues associated with various property transactions. Pre: 3314. (3H,3C)

4414: FINANCIAL STATEMENT AUDITING
Study of external financial statement auditing, professional code of conduct, audit evidence considerations, internal control, fraud, and transaction cycles, and audit reporting. II, IV Pre: 3414. (3H,3C)

4504: ACCOUNTING APPLICATION DEVELOPMENT
Utilizes current software tools to design and develop segments of accounting systems using database management techniques. Provides an understanding of relational databases, query languages, and web-based business processing. Includes exposure to latest relevant technology and software. Provides development knowledge of controls in accounting information systems. Pre: 3504. (3H,3C)

4514: DATABASE MANAGEMENT SYSTEMS
Introduction to database management systems and their use in business. Topics covered include data modeling, normalization, SQL, transaction management and concurrency control, security issues, physical data organization, query optimization, hierarchical queries, distributed database management systems, object-oriented databases, client/server databases, multidimensional databases, data mining, data warehousing, and database administration. Pre: 3515. (3H,3C)

4524: APPLIED SOFTWARE DEVELOPMENT PROJECT
Application of computer programming and system development concepts, principles, and practices to a comprehensive system development project. A team approach is used to analyze, design, and document realistic methods, project complexity. Use of project management methods, project scheduling and control techniques, formal presentations, walk throughs, and group dynamics in the solution of information systems problems. Pre: 3515 or 4514 or 4515. (3H,3C)

4554 (BIT 4554): NETWORKS AND TELECOMMUNICATIONS IN BUSINESS
This course provides an in-depth introduction to computer networks and data communications in business. Topics include mechanisms for reliable data transfer, local and wide area network topologies and technologies, and a comprehensive treatment of internetworking. The benefits, costs, and security issues related to using computer networks are discussed, along with network design issues, and methodologies for network applications. One semester of college-level programming experience required. Pre: 3504 or 3515 or BIT 3424. (3H,3C)

4564 (BIT 4564): OBJECT-ORIENTED SYSTEMS DEVELOPMENT FOR BUSINESS
The course first develops the foundations and principles of object-oriented programming, including encapsulation, inheritance, polymorphism, and abstraction. These concepts are acquired via comprehensive hands-on experience with a current OOP language (such as Java). The second portion of the course applies concepts learned to a business-oriented application, such as a web-based, e-commerce scenario. Pre: CS 1054, (ACIS 3515 or BIT 3444). (3H,3C)

4584 (BIT 4584): CLIENT/SERVER APPLICATIONS DEVELOPMENT FOR BUSINESS
Study of software tools and techniques for designing and developing client/server applications for business. Topics include the architectures of contemporary client/server development tools, client/server development methodologies, and business applications using the client/server paradigm. Pre: 4554 or BIT 4554. (3H,3C)

4594 (BIT 4594): ELECTRONIC COMMERCE SYSTEMS
Study of the design of implementation of computer systems on the Internet and world-wide-web used for electronic commerce. Emphasis of the course will be on understanding the numerous issues involved in using the Internet and web as tools for the production and distribution of goods and services. Topics will include basics of electronic commerce, security issues in financial and sensitive data transfer, unique aspects of business-

oriented commerce such as supply-chain management in relation to consumer commerce, legal and international issues in electronic commerce, building and maintaining an electronic commerce website, and future trends in electronic commerce. Pre: BIT 3414. (3H,3C) I.

4684: INFORMATION SYSTEMS SECURITY AND ASSURANCE
An examination of the concepts, technologies, and applications of security and assurance in information systems. Topics include the security threats against information systems; tools used by intruders; computing platforms and security; encryption; securing the transaction and the server; audit tools to detect intrusions; responses to attacks; legal, ethical and international issues; and the future of information systems security and assurance. Pre: 4554 or BIT 4554. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

Business Information Technology

www.bit.vt.edu/

B. W. Taylor III, Head
Andersen Professor of Management Science: L. P. Rees
Bank of America Professor: C.T. Ragsdale
R. B. Pamplin Professor of Management Science: B. W. Taylor III
Houchens Professor of Management Science: T. R. Rakes
Professors: R. D. Badinelli; D. F. Cook; P. Ghandforoush; R. S. Russell; R. E. Sorensen
Associate Professors: B. J. Hoopes; T. L. James; R. L. Major; L. A. Matheson; Q. J. Nottingham; C. W. Zobel
Assistant Professors: A. S. Abrahams; J. K. Deane; L. Z. Khansa; B. C. Kim; O.Seref; G. Wang
Instructors: L.L. Clark; R. M. Jones
Career Advisor: B. W. Taylor III (231-6596)

Overview

The Department of Business Information Technology offers an undergraduate major in business information technology with options in computer-based decision support systems and operations and supply chain management. The department also offers and staffs business courses, including: quantitative models and methods in business, operations and supply chain management, and computer modeling and simulation in business. Business information technology (BIT) courses are listed below.

The department participates in the Cooperative Education Program in which qualified students may alternate semesters of study with semesters of professional employment.

Business Information Technology

The curriculum in business information technology is designed to provide the student with expertise in the quantitative and technological aspects of management, specifically including the extensive use of computers for solving business problems and making managerial decisions. The name business information technology implies the application of scientific principles and techniques, mathematics, and computing to the management function with the objective of increased efficiency and productivity. Thus, the student of business information technology not only learns various quantitative techniques and models to apply to managerial problems, but also a logical and scientific approach to managerial decision-making. The curriculum provides training both for individuals interested in pursuing careers in business management and for individuals interested in pursuing graduate or professional degrees. Students majoring in business information technology may choose one of two options reflecting their particular career objectives and interests.

Option I - Computer-Based Decision Support Systems

- This option educates the student in the design, implementation, and use of computerized information systems, decision support systems, and expert systems which support contemporary business managers in the decision-making process. Special emphasis is placed on increased productivity through the use of models, quantitative data, and techniques in the computerized decision support system. Training in Option I will enable graduates of this program to pursue careers in business and industry in which computer-aided decision-making is an essential component of the managerial function.

Option II - Operations and Supply Chain Management

- This option educates students in the management of activities directly related to the creation and distribution of goods and services. The curriculum of Option II is designed to provide the student with expertise in the planning and control of business processes within a firm and across its global supply chain. Emphasis is placed on applying IT and process analysis skills to improve the quality and productivity of business firms and their supply chain partners. Graduates of this program will be prepared to pursue careers as operations managers, business process analysts, quality assurance specialists, supply chain specialists, and quality control, logistics, inventory and procurement managers in business, industry, and government.

Requirements

In addition to fulfilling the college of business requirements for the first two years and the core upper-division business requirements, the students electing this major will take a series of commonly required courses and then select between two options of concentration:

Required Courses:	
CS 1054: Intro to Programming in Java	(3)
MGT 4394: Business Policy and Strategy	(3)
BIT 3424: Computer Modeling and Decision Analysis	(3)
BIT 3434: Advanced Management Science	(3)
BIT 3444: Advanced Business Computing and Appl.	(3)
BIT 4434: Computer Simulation in Business (option II only)	(3)
Option I - Computer-based Decision Support Systems	
Required BIT Courses:	
BIT 4444: Web-Based Decision Support Systems	(3)
BIT 4454: Business Analysis Seminar in IT	(3)
BIT 4514: Database Technology for Business	(3)
BIT 4524: Systems Development	(3)
BIT 4554: Networks and Telecommunications in Business	(3)
Electives: BIT 3454, 3464, 4434, 4464, 4474, 4534, 4544, 4564, 4574, 4584, 4594, 4614	
Option II - Operations and Supply Chain Management	
Required BIT Courses:	
BIT 3454: Quality & Process Improvement Methods	(3)
BIT 3464: Enterprise Planning & Control Systems	(3)
BIT 4464: Advanced Supply Chain Management	(3)
BIT 4474: Global Operations & Information Technology	(3)
BIT 4484: Project Management	(3)

Undergraduate Course Descriptions (BIT)

1614 (ACIS 1614) (CS 1614): INTRODUCTION TO LIVING IN THE KNOWLEDGE SOCIETY (LIKES)
Introduces computing concepts needed by students to live in the emerging Knowledge Society. Prepares students to take courses in the Curriculum for Liberal education that are part of the pathway with theme Living in the KnowlEdge Society (LIKES)- i.e., the LIKES themed core. Surveys key paradigms of computing, problem solving, programming, modeling and stimulation, and software engineering. Relates these to the Knowledge Society, covering data, information, and knowledge, considering hypermedia, human-computer interaction, presentation, visualization, networking and communication. Students are prepared to understand the (potential) application of computing to society in general and in their disciplines. (1H,1C)

2405,2406: QUANTITATIVE METHODS
Study of quantitative techniques used in managerial decision-making. BIT 2405: Data collection, descriptive statistics, probability theory, and statistical inferential procedures. BIT 2406: Linear regression and correlation analysis, forecasting, mathematical modeling, and network models. Pre: ACIS 1504, MATH 1525, MATH 1526 for 2405; 2405 for 2406. (3H,3C)

2954: BUSINESS STUDY ABROAD
This course provides students with an international business experience. It is only offered as part of a program outside of the United States. Students will learn from the structured educational experience developed by the faculty leader. This course is intended for students who want to develop information technology or operations management related free electives. Pre: Instructor's consent and the completion of 24 semester hours with a minimum GPA of 3.0 or departmental consent. Variable credit course.

3414: OPERATIONS AND SUPPLY CHAIN MANAGEMENT
Study of the process directly related to the creation and distribution of goods and services. Increasingly, these operations are taking place outside the boundaries of a traditional enterprise. This course teaches students how to analyze processes, ensure quality, create value, and manage the flow of information, products and services across a network of customers, enterprises and supply chain partners. Pre: 2406. (3H,3C)

3424: COMPUTER MODELING AND DECISION ANALYSIS
Computer solution of topics introduced in BIT 2406. Includes computer solution and analysis of management problems using such techniques as linear programming, goal programming, inventory, simulation, and information systems. Spreadsheet and database software will be used to solve these problems. Pre: CS 1054. (3H,3C)

3434: ADVANCED MANAGEMENT SCIENCE
Study of selected, advanced topics in decision modeling and analysis. Emphasis on model formulation, solution techniques, interpretation of results and comprehensive approaches to problem-solving. Topics include various methods for modeling and optimization such as integer, goal, and nonlinear programming as well as network analysis and Markov analysis. Includes case studies and use of Excel as the primary analytical tool. Pre: 2406, 3424. (3H,3C)

3444: ADVANCED BUSINESS COMPUTING AND APPLICATIONS
Study of selected advanced topics in business computing. Construction of business applications using an advanced application development environment such as Visual Studio.net. Coverage of computer terminology, HTML, and internet applications. The course builds computer literacy and strong programming skills. Junior standing required. Pre: 2406, 3424. (3H,3C)

3454: QUALITY AND PROCESS IMPROVEMENT METHODS
This course examines the technical aspects of quality management for production operations, service operations and software systems development. Various data and information analysis techniques are developed using a high level business programming language. Quality assurance techniques for software development and analytical techniques for process improvement are emphasized. Pre: 3414. (3H,3C)

3464: ENTERPRISE PLANNING AND CONTROL SYSTEMS
The study of the design, analysis and implementation of enterprise-wide resource planning and control systems. The course examines decision support models for production planning, master scheduling, inventory control, shop floor control and related topics in planning and control. The course emphasizes the application of information technologies such as ERP, MRPII, CIM to operations planning and control. Pre: 3414. (3H,3C)

3544 (ACIS 3544): MANAGEMENT OF INFORMATION SYSTEMS AND TECHNOLOGIES
The course provides the necessary background to enable management information systems personnel to understand tradeoffs in information systems hardware, software, and architecture for effective use in the business environment. Topics covered include information technology planning and strategy, trends in computer hardware and systems software, telecommunications and network management, control and management of information resources, distributed and client-server technologies, and data representation and visualization. Partially duplicates CS 1104. Pre: (CS 1054 or BIT 3444). (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4414: SERVICE OPERATIONS MANAGEMENT
A comprehensive study of the management of service operations, with particular emphasis on B2B (business to business) services. Topics include the service economy, service system design and delivery, service strategy, and decisions in support of service strategy, such as service quality, service innovation, service technologies, and the optimization of service resources. Pre: 3414, FIN 3104, MKTG 3104, MGT 3304. (3H,3C)

4434: COMPUTER SIMULATION IN BUSINESS
In-depth study of the application of computer simulation techniques to business decision making and process improvement. The theory of computer simulation and statistical analysis of results are included. Attention is focused on using simulation software stressing application to specific problems. Pre: 2406. (3H,3C)

4444: WEB-BASED DECISION SUPPORT SYSTEMS
Study of current technologies for designing and constructing interactive, Internet-based systems for supporting business decisions. Topics may include the operation of the Internet, server-side programming, client-side programming, server-side scripting, XML, XHTML, database integration, COM, CGI, and others. Design issues will be explored through a class project. Pre: 3444. (3H,3C)

4454: BUSINESS ANALYSIS SEMINAR IN IT
Comprehensive treatment of Decision Support Systems (DSS) as managerial tools, particularly in an e-commerce environment. Emphasis is at the builder and user level. A primary emphasis is on problem solving through the integration of various quantitative techniques as well as on IT concepts. The course includes a comprehensive project using state-of-the-art software. Pre: 3434, 4444, 4514, 4524. (3H,3C)

4464: ADVANCED SUPPLY CHAIN MANAGEMENT
Advanced study of efficient methods for streamlining the production and delivery of products and services across functions, enterprises and global boundaries. Topics include the facilities, functions, technologies, and activities involved in creating and delivering products and services, especially in a digital marketplace. Designing and managing a network of suppliers across enterprises is discussed, along with the information systems, risk management and planning issues involved. Pre: 3414. (3H,3C)

4474: GLOBAL OPERATIONS AND INFORMATION TECHNOLOGY
This course includes concepts and issues critical in the globalization of business operations and information technology. Topics covered include the organization of global operations, cultural and national comparisons, planning global operations, facilities location, product development, technology transfer, global communication links, transborder data flow, international information systems, and other emerging operations and information technology issues. Pre: 3414. (3H,3C)

4484: PROJECT MANAGEMENT
Study of efficient methods for planning and controlling projects. Topics include project management and scheduling tools, project quality assurance, risk and cost control, resource constrained scheduling, definition and requirements analysis, task integration, and managing alliances. The application of information technology to project management and control is emphasized throughout the course. Pre: 3414. (3H,3C)

4494: NETWORK SIMULATION MODELING AND ANALYSIS IN BUSINESS
Analysis of business systems that can be modeled as networks. A language and software package such as SLAM (mainframe version) or SLAM System (PC version) will be used. A graphical menu driven network modeling system for the personal computer will be the primary simulation

methodology emphasized, providing both a networking language capability and a programming interface capability. Extensive use will be made of both the network modeling feature and the program interface to build and analyze business simulation models. Pre: 2405, 3444, 3424. (3H,3C)

4514: DATABASE TECHNOLOGY FOR BUSINESS
Study of the design of databases and data structures for supporting business. Topics include basic database structure and design, structured query language, database management systems, integration of backend database servers, data warehousing and mining, on-line analytical processing, and database application, security, and management. Pre: 3424, 4524. (3H,3C)

4524: SYSTEMS DEVELOPMENT
Study of the current technologies for designing and developing computer-based business systems. Topics will include process, logic, and conceptual data modeling methodologies such as Uniform Modeling Language (UML) and important design-related issues such as data flows and system capabilities. Design issues will be explored through class projects. Pre: 3424. (3H,3C)

4534: VISUAL INTERFACE DESIGN FOR DECISION SUPPORT
Study of the design of visual user interfaces for computerized decision support systems in a business context. Primary emphasis is upon the Windows desktop development environment, but emerging trends in hardware and software affecting interface design are covered as well. Course includes several interface design projects implementing the concepts learned. Pre: 3444 or ACIS 2504. (3H,3C)

4544: ARTIFICIAL INTELLIGENCE FOR DECISION SUPPORT
Study of key artificial-intelligence techniques and their role in decision making in the business context. Primary emphasis is upon knowledge-based systems and neural networks, but fuzzy logic concepts and genetic algorithms are covered as well. Course includes a major software project implementing concepts learned. Pre: 3444 or ACIS 2504. (3H,3C)

4554 (ACIS 4554): NETWORKS AND TELECOMMUNICATIONS IN BUSINESS
This course provides an in-depth introduction to computer networks and data communications in business. Topics include mechanisms for reliable data transfer, local and wide area network topologies and technologies, and a comprehensive treatment of internetworking. The benefits, costs, and security issues related to using computer networks are discussed, along with network design issues, and methodologies for network applications. One semester of college-level programming experience required. Pre: 3424 or ACIS 3515 or ACIS 3504. (3H,3C)

4564 (ACIS 4564): OBJECT-ORIENTED SYSTEMS DEVELOPMENT FOR BUSINESS
The course first develops the foundations and principles of object-oriented programming, including encapsulation, inheritance, polymorphism, and abstraction. These concepts are acquired via comprehensive hands-on experience with a current OOP language (such as Java). The second portion of the course applies concepts learned to a business-oriented application, such as a web-based, e-commerce scenario. Pre: CS 1054, (ACIS 3515 or BIT 3444). (3H,3C)

4574: ADVANCED NETWORKING FOR BUSINESS
Study of advanced concepts and techniques for distributed computer networking and data communications in business. Topics may include new developments in both wired and wireless networking technologies, network planning and design, network security, and network management and disaster planning. Pre: 4554 or ACIS 4554.
(3H,3C)

4584 (ACIS 4584): CLIENT/SERVER APPLICATIONS DEVELOPMENT FOR BUSINESS
Study of software tools and techniques for designing and developing client/server applications for business. Topics include the architectures of contemporary client/server development tools, client/server development methodologies, and business applications using the client/server paradigm. Pre: 4554 or ACIS 4554. (3H,3C)

4594 (ACIS 4594): ELECTRONIC COMMERCE SYSTEMS
Study of the design and implementation of computer systems on the Internet and world-wide-web used for electronic commerce. Emphasis of the course will be on understanding the numerous issues involved in using the Internet and web as tools for the production and distribution of goods and services. Topics will include basics of electronic commerce, security issues in financial and sensitive data transfer, unique aspects of business-oriented commerce such as supply-chain management in relation to consumer commerce, legal and international issues in electronic commerce, building and maintaining an electronic commerce website, and future trends in electronic commerce. Pre: 3414. (3H,3C) I.

4614: INFORMATION SECURITY
Study of policies, procedures, and technologies for enhancing the security of information. Topics include physical security, communications security, emissions security, computer security, and network security. The core security goals of confidentiality, integrity, and availability are emphasized throughout the course. Pre: 4554 or ACIS 4554. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

Finance, Insurance, and Business Law

http://www.finance.pamplin.vt.edu
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Raman Kumar, Head
Suntrust Professor of Finance: G.E. Morgan
Suntrust Professor of Banking: J.M. Pinkerton
J. Gray Ferguson Professor of Finance: V. Singal
R. B. Pamplin Professors of Finance: A.J. Keown; G.B. Kadlec
R.V. and A.F. Oliver Professor of Investment Management: R. Kumar
Professors: J.S. Hiller; D.M. Patterson; M.I. Schneller; D.K. Shome; G.R. Thompson
Associate Professors: R.S. Billingsley; V.A. Bonomo; J.C. Easterwood; S. Mansi; A. Mozumdar
Assistant Professors: Y. Chen, M. Cliff; O. S. Ince; A. Kecskes; C. J. Ullrich
Instructors: VV. Bongard; S. Gardner; C. Giles; Brian Hart; Mike Kender; D. Klock; E. Johnsen; W. Newton; K. Sullivan
Career Advisor: D. Klock

Overview

Finance is a specialty that works with the development, allocation and use of monetary resources within established legal and ethical frameworks, while understanding and mitigating the associated risks. Money is a critical component of the economic system and its flow is the sustaining force of the U.S. and global economy. Therefore, in working with how governments, corporations, intermediaries, and households utilize their financial assets finance professionals are an integral part of how the economy perpetuates the standard of living that we enjoy.

Traditionally there are three separate but related fields within finance: 1) corporate financial management or “business finance” which focuses on the internal decisions of companies to raise funds and invest in corporate assets; 2) investment management which focuses on the purchase and sale of stocks and bonds or their derivatives by individuals and institutions; and 3) financial services management, which focuses on the management and regulation of institutions and the role that financial institutions play in the economy.

The undergraduate program in Finance meets the requirements of students who desire specialized careers in financial management. Students gain expertise in both accounting and finance, essential for success as a financial professional. The case-oriented focus of coursework requires students to apply their knowledge and strengthen their oral and written communication skills. The department offers specializations in (i) Corporate Financial Management, (ii) Investment Management and the CFA® (Chartered Financial Analyst) program, based on the CFA® curriculum as recognized and approved by the CFA Institute, (iii) Financial Services Management, (iv) Financial Accounting, and (v) Certified Financial Planner (CFP®) program with approval of the CFP Board. Students also have the opportunity to participate in student management funds focused on investments in bonds (BASIS) and in stocks (SEED).

The curriculum offers courses in finance, insurance, and business law, but a major only in finance.

Requirements

Students electing this major will take a series of commonly required courses required by the college and the university.

In addition, Finance majors are required to take the following courses in their Junior and Senior years:

FIN 3134: Finance Concepts and Skills
FIN 3144: Investments: Debt, Equity and Derivatives
FIN 3154: Corporate Finance
ACIS 3115: Financial Accounting
ACIS 2504: Personal Computers in Business
Plus Finance electives depending on their specialization

Students are able to choose their electives from the following courses offered by Finance and ACIS. Fin 4244, Fin 4254, and Fin 4274 are approved Writing Intensive courses.

FIN 4224: Fixed Income Securities: Analysis and Management
FIN 4234: Venture Capital and Investment Banking
FIN 4244: Asset Valuation and Corporate Governance
FIN 4254: Bank Management and Financial Services
FIN 4264: Managing Risk with Derivatives
FIN 4274: Equity Securities: Analysis and Management
FIN 4144: International Financial Management
FIN 4154: Real Estate Finance
ACIS 3116: Intermediate Financial Accounting
ACIS 3314: Tax Impact on Decisions
ACIS 3215: Cost Accounting
ACIS 4214: Cost Planning and Control
FIN 3164: Careers in Finance (1 credit, P/F only)

Students select different combinations of elective courses to fulfill the requirements of one or more of the five tracks offered. The five tracks are: General Finance, Investment Management and CFA®, Corporate Financial Management, Financial Services Management, Financial Accounting, and CFP®track.

Requirements for different tracks:

Investment Management and CFA® Track:	Select FIN 4224, FIN 4264, FIN 4274, and FIN 4144.
Corporate Financial Management Track:	Select FIN 4234, FIN 4244, FIN 4264, and FIN 4144.
Financial Services Management Track:	Select FIN 4254, FIN 4264, and FIN 4144. Select either FIN 4224 or FIN 4234.
Financial Accounting Track:	Select ACIS 3116 and [ACIS 3314, ACIS 3215 or ACIS 4214] and two Finance courses from the elective courses with at least one being an in-major WI approved course.
CFP® Track:	Select FIN 3204 (Risk and Insurance), FIN 4004 (Wills, Trusts, and Estates), ACIS 3314 (Tax Impact on Decisions), ACIS 4314 (Principles of Taxation), AAEC 3104 (Financial Planning for Professionals), AAEC 4104 (Retirement Planning), and AAEC 4134 (Financial Planning Applications), and one of FIN 4254 and FIN 4274.
General Finance Track:	Select 12 Semester Hours from the Elective courses. At least 6 hours must be Finance courses with at least one being an in-major WI approved course.

Undergraduate Course Descriptions (FIN)

2954: BUSINESS STUDY ABROAD
This course provides students with an international business experience. It is only offered as part of a program outside of the United States. Students will learn from the structured educational experience developed by the faculty leader. Pre: Instructor's consent and the completion of 30 SH with a minimum GPA of 3.0 or departmental consent. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

3055-3056: LEGAL ENVIRONMENT OF BUSINESS
Examines the legal environment in which businesses operate, specifically addressing both private law involving the relationships between individual businesses and public law involving the legal relationship between businesses and society. Junior standing required. (3H,3C) I,II,III.

3064: LEGAL ENVIRONMENT OF BUSINESS FOR ACCOUNTANTS

Examines the legal environment in which businesses operate, specifically addressing both private law involving the relationships between individual businesses, and public law involving the legal relationship between businesses and society. The course is geared specifically for accounting students who will take the CPA exam. Junior standing required. Pre: 3055. (3H,3C) II.

3104: INTRODUCTION TO FINANCE
Overview of financial decision-making process focusing on the creation of wealth. Topics covered include the time value of money, how stocks and bonds are valued, financial decision-making within a firm, an overview of financial markets, and investment banking. The course is designed for finance and non-finance majors. Junior standing required. Pre: ACIS 2115 or ACIS 2004. (3H,3C) I,II,III,IV.

3114: INTERMEDIATE FINANCIAL MANAGEMENT
Analysis of the concepts critical to the financial manager in a contemporary environment--risk valuation, cost of capital, capital structure, long-term finance, as well as topics of special interest like mergers, leasing, and multinational finance. Junior standing required. Pre: 3104. (3H,3C) I,II,III.

3134: FINANCE CONCEPTS AND SKILLS
Key concepts and computational skills in finance. Time value of money, risk and return, and the basics of capital investment, security valuation and interest rate determination. Junior standing required. Pre: ACIS 2115 or ACIS 2004. Co: ACIS 2504. (3H,3C)

3144: INVESTMENTS: DEBT, EQUITY AND DERIVATIVES
Risk, return and portfolio theory, knowledge of financial securities and markets. Introduction to mutual funds, financial securities and markets, portfolio analysis, market efficiency and performance evaluation, bond valuation, term structure of interest rates, interest rate risk, security analysis and stock valuation, options, Black-Scholes option pricing model, and futures. Must have a grade of C or better in prerequisite of FIN 3134, and Junior standing required. Pre: 3134. (3H,3C)

3154: CORPORATE FINANCE
Types of financial management decisions that firms make, the environment in which decisions are made, the available choices and decision criteria, and valuation consequences of these choices. Determination of a firm's optimal debt- equity ratio, estimation of cost of capital, evaluation of capital investments, divided policy, and sources of financing. Must have a grade of C or better in prerequisite of FIN 3134, and Junior standing required. Pre: 3134. (3H,3C)

3164: SURVEY OF FINANCE AND CAREER PLANNING
Career opportunities and job search strategies in the finance field with ties to the finance courses that best help the student identify a career in his/her selected field. Junior standing required. (1H,1C)

3204: RISK AND INSURANCE
Surveys the concept of risk as it applies to the nuclear family and as a socio-economic force in society. Risk management techniques utilizing social and proprietary insurance to neutralize the effect of risks inherent in daily life: termination or suspension of earnings, liability exposures, and potential losses of real and personal property values. Junior standing required. (3H,3C) I,II,III.

3304: SURVEY OF INVESTMENTS
Examines the basic principles and concepts in investing with emphasis on investment decisions of the individual investor. Coverage of the financial environment, financial instruments, risk and return, portfolio management and performance evaluation. Not available for credit for business majors. Junior standing required. (3H,3C) I,II.

3954: STUDY ABROAD
Variable credit course.

4004: WILLS, TRUSTS, AND ESTATES
Examines the control of assets through the creation and use of trusts, and the control of property through estate planning. The course emphasizes financial planning through estate management both personally and as a part of a business plan. Pre: 3055. (3H,3C)

4014: INTERNET, ELECTRONIC AND ONLINE LAW
Study of the international legal environment and regulation of the electronic world, including electronic commerce, computer and media communication issues, and speech over the Internet. Webpage design, copyright, electronic payment, electronic contract, encryption, and privacy are some issues to be examined. Topics will be updated continually to reflect the newest developments of the law as applied to the electronic world of commerce. Pre: Junior/Senior standing or consent of instructor. (3H,3C)

4024: LEGAL ASPECTS OF A DIVERSE WORKPLACE
Examines the history and evolution of law of the workplace. Employee rights, equal employment, and affirmative action in the areas of age, sex, race, religion, national origin, and disability are viewed in the context of an increasingly diverse workplace. Case law and case studies are emphasized. Specific statutes covered include, among others, Title VII of the 1964 Civil Rights Act and the Americans with Disabilities Act. (3H,3C)

4104: ADVANCED FINANCIAL MANAGEMENT
Finance 4104 applies the case method to selected areas of financial decision making within the corporation. Emphasis is placed on isolating key financial issues and designing creative and reasonable recommendations for action. Pre: 3114. (3H,3C) I,II.

4114: INVESTMENT ANALYSIS AND EQUITY MARKETS
Examines the role and functioning of equity markets. Specific topics include security valuation, portfolio theory, efficient market hypothesis, asset allocation and portfolio management, mutual fund performances, evaluation and selection, stock options, and futures contracts. Pre: 3104. (3H,3C) I,II.

4124: INTEREST RATES AND DEBT MARKETS
Analysis of fixed income securities. The course covers topics in the foundations, term structure, and risk structure of interest rates, government and corporate bond markets, valuation, managing bond risk, asset backed securities, and the management of debt funds. Pre: 3104. (3H,3C) I,II.

4134: COMMERCIAL BANK MANAGEMENT
Emphasis on the major issues facing managers of financial institutions focusing primarily on commercial banks. Topics include asset, liability, and capital management, the regulatory environment, and special topics. Pre: 3104. (3H,3C) I,II.

4144: INTERNATIONAL FINANCIAL MANAGEMENT
Explores the environmental challenges facing the financial manager of a multinational corporation and the tools and techniques developed to meet such challenges. Pre: 3104. (3H,3C) II.

4154: REAL ESTATE FINANCE
This course introduces the fundamentals of both real estate financing and investment. Conventional mortgages as well as more creative financing methods will be analyzed. The secondary market for mortgages and relevant institutional factors also will be examined. Investment analysis of real estate will be viewed in a capital budgeting framework; appropriate tax law will be discussed as it affects real estate cashflows. Pre: 3104. (3H,3C) II.

4164: FINANCIAL DERIVATIVES I
Examines the use of financial derivatives in managing the risk of decisions in financial markets. Overview of financial derivatives. Option principles, pricing and strategies. Review of pricing spot assets. Futures and forward contract principles, pricing and strategies. Pre: 3114 or 4114. (3H,3C) I,II.

4174: FINANCIAL DERIVATIVES II
Continuation of 4164 with coverage of advanced strategies involving options on futures, currency derivatives, interest rate derivatives including swaps, options, forward rate agreements, structured notes and mortgage-backed securities. Advanced equity derivatives. Risk management of corporations and dealers. Pre: 4164. (3H,3C) II.

4184: INVESTMENT BANKING
Study of the operation and practices of investment banks involved with the raising of capital for private and public enterprises and the restructuring of private enterprises and government entities with investment banks and universal banks. The course will emphasize both the U.S. industry, and the rapidly evolving global industry. In addition to examining several different transactions, the course will examine competition and regulation issues. Time will also be spent covering the nature of conflicts of interest and ethical dilemmas that are inherent in investment banking. Topics will be updated periodically to reflect recent trends and innovations within the industry. Pre: 3114. (3H,3C)

4224: FIXED INCOME SECURITIES: ANALYSIS AND MANAGEMENT
Analysis of fixed income securities, including corporate bonds, U.S. Treasury notes and bonds, municipal bonds, money market securities, and home mortgages. The analysis include interest rate risk, credit risk, bond valuation theory, and the valuation of embedded options in the bond contract. Theories of the term structure of interest rates are presented. Must have a grade of C or better in
prerequisites of FIN 3144 and 3154. Pre: 3144, 3154. (3H,3C)

4234: VENTURE CAPITAL AND INVESTMENT BANKING
Explores the venture capital cycles of fund-raising, investing in portfolio firms, and exiting the investment. Focuses on the role of investment banking in the exiting of investments by taking the portfolio firms public through initial public offerings. Includes a conceptual component and an applied component in which the case method is used. Must have a grade of C or better in prerequisites of FIN 3144 and 3154. Pre: 3144 or 3144, 3154 or 3154. (3H,3C)

4244: ASSET VALUATION AND CORPORATE GOVERNANCE
The effect of corporate governance on asset-valuation. Case oriented course focusing on the valuation of non-financial assets such as projects, business units, private and public firms. Topics include method of comparables, discounted cash flow methods and the real options approach to valuation. Examines the external and internal governance mechanisms for preserving and enhancing the value of a firm. Must have a grade of C or better in prerequisites of FIN 3144 and 3154. Pre: 3144, 3154. (3H,3C)

4254: BANK MANAGEMENT AND FINANCIAL SERVICES
The functions of financial service providers and the risks inherent in the provision of banking and other financial services. Regulatory background and issues. Case oriented course. Must have a grade of C or better in prerequisites of FIN 3144 and 3154. Pre: 3144, 3154. (3H,3C)

4264: MANAGING RISK WITH DERIVATIVES
The types, payoff, and pricing of derivative securities and contracts and their application in managing financial risks faced by corporations. Topics include options, forwards, futures and swaps; managing foreign currency risk, interest rate risk, stock price risk, and commodity price risk; and risk management techniques. Must have a grade of C or better in prerequisites of FIN 3144 and 3154. Pre: 3144, 3154. (3H,3C)

4274: EQUITY SECURITIES: ANALYSIS AND MANAGEMENT
Advanced valuation and analysis of equity securities with case applications. Critical analysis of advanced equity asset pricing models. Analysis of advanced equity portfolio management techniques, equity portfolio performance measurement, and equity portfolio performance attribution analysis. Identification and analysis of market anomalies and recent developments in equity analysis. Must have grade of C or better in prerequisites of FIN 3144 and 3154. Pre: 3144, 3154. (3H,3C)

4284: FREE MARKETS, INDIVIDUAL FREEDOM, AND ECONOMIC WELFARE
Course exposes students to various viewpoints on the role free markets can and do play in promoting individual freedom. Allocation of scarce resources, and in enhancing welfare. Explores the strengths and weaknesses of capitalism by critically evaluating the relationship between the economic efficiency achieved by capitalism and the attainment of welfare objectives. Other topics include current items such as globalization, price controls, income equality, outsourcing, corporate pricing power though monopoly/oligopoly, and government regulation of the economy. Pre-requisite: Senior standing and permission of the instructor. (3H,3C)

4614: ADVANCED TOPICS IN FINANCE
Study of advanced topics in finance. This course will consist of timely, in-depth analyses of advanced, contemporary topics of interest in corporate finance, investments, or capital markets. The course may be taken twice with different topics. Junior/senior standing and the consent of the instructor is required. Pre: 3104. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

Hospitality and Tourism Management

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R. R. Perdue, Head
P. A. Weaver, Undergraduate Coordinator
Professors: M. A. Khan; K. W. McCleary; S. K. Murrmann; R. R. Perdue; M. Uysal; P. A. Weaver
Associate Professor: N. McGehee
Assistant Professors: V. Magini; M. Singal
Instructors: P. Couture
Lecturers: H. Feiretag; J. E. Sexton
Adjunct Faculty: T. Duetsch; P.W. Kipp; K. Krause; D. McAlister

Overview

Choosing a career in the hospitality field means becoming involved in one of the nation's largest industries. The opportunities for employment are broad in scope, and graduates are actively recruited each year by numerous hospitality firms. Management positions are available with hotels, motels, restaurants, contract food service companies, convention bureaus, private clubs, travel and tourism organizations, resorts, theme parks, and corporations. The most important qualities necessary for success in this field are an interest in management, enjoyment in working with people, and the drive to meet the challenges of this dynamic industry.

This major is designed to prepare business students for successful careers in the Hospitality and Tourism Industries. The program core courses focus on hospitality operations and advanced applications of business principles and strategies to the unique challenges of hospitality and tourism management. Students can choose areas of emphasis in Hospitality Operations Management, Restaurant and Food Management, Meetings and Event Management, Global Tourism Management, and Club and Resort Management. The curriculum includes substantive work experience requirements through internships in the industry. Many students work with the Inn at Virginia Tech and Skelton Conference Center on campus or with other hospitality firms throughout Virginia, the USA, and, in some cases, in foreign countries. Study abroad and work experience opportunities exist in England, Australia, Switzerland, the Dominican Republic, and Mexico.

In addition to fulfilling the college of business requirements for the first two years and the core upper-division business requirements, each student must meet the following course requirements and a total of 125 semester hours to graduate:

HTM 3414 Purchasing, Production and Management	(4)
HTM 3444 Financial Mgt. & Cost Control for Hospitality Org.	(3)
FIN 3055 Legal Environment in Business	(3)
HTM 3524 Lodging Management	(3)
HTM 4414 Food and Beverage Management	(3)
HTM 4464 Human Resource Management in the Hospitality Industry	(3)
HTM 4964 Field Study	(3)
Plus 6 hours of the following– 3 hours must be at the 3000 level or above:	
HTM 2434 Hospitality Sales	(3)
HTM 2454 Travel & Tourism Management (satisfies Area 7)	(3)
HTM 2464 Introduction to Service (fulfills 2nd Social Science course)	(3)
HTM 2474 Intro to Meeting and Convention Management	(3)
HTM 2514 Catering Management	(3)
HTM 2954 Study Abroad	(3)
HTM 2964 Field Study	(3)

HTM 3044 Private Club Management	(3)
HTM 3114 Special Topics	(3)
HTM 3454 Tourism Analysis	(3)
HTM 3464 Hospitality & Tourism Research Methods I	(3)
HTM 3474 Hospitality Facilities Planning and Management	(3)
HTM 3484 Socio-Cultural Impacts of Tourism	(3)
HTM 3954 Study Abroad	(3)
HTM 4424 Events Management	(3)
HTM 4444 Winery Tourism	(3)
HTM 4454 Hospitality Management	(3)

A sequence of 2 foreign language courses is required for graduation unless 2 high school credits of the same foreign language or 6 transfer hours credit of foreign language have been earned. These credits do not count toward graduation.

Satisfactory Progress

Prior to enrolling in junior business courses, students must have earned at least 60 semester hours; have a GPA of 2.0 or better in the combined series in MATH, ACIS, BIT, and ECON courses with no grade lower than a C- in any of these courses; and have a cumulative GPA of 2.0 or better for all coursework. To graduate, students must have an overall GPA of at least 2.0 and an in-major GPA of at least 2.0.

Undergraduate Courses (HTM)

1414: INTRODUCTION TO HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT
Management in the hospitality industry, its scope, forms of organization, and professional opportunities. (3H,3C).

2434: HOSPITALITY SALES
A comprehensive study of the management of the sales function and its role in the overall financial performance of hospitality operations. (3H,3C)

2454: TRAVEL & TOURISM MGT
Survey of travel and tourism in the United States and abroad with a focus on terminology, demographics, economic, socio-cultural and environmental impacts of tourism and travel, and the industry's management issues in a global context. (3H,3C)

2464: INTRO TO SERVICE
An overview of the service industry, history, current status, and future trends. Emphasizes the unique characteristics and operations of service organizations. (3H,3C)

2474: INTRODUCTION TO MEETINGS & CONVENTION MANAGEMENT
A study of the meetings and convention industry. Focus on the components and processes involved in developing and conducting meetings and conventions. (3H,3C)

2514: CATERING MANAGEMENT
Introduces students to various venues in which catering services can be offered, and presents an overview of the functions, processes, and controls found in successful catering management and operations; emphasis is placed on the sales/marketing aspects of the business. (3H,3C)

2954: HOSPITALITY AND TOURISM STUDY ABROAD
This course provides students with an international hospitality and tourism management business experience. It is only offered as part of a program outside the United States. Students will learn from the structured educational experience developed by the faculty directing the study abroad program. This course can be taken twice for a maximum of six credit hours. Sophomore standing and a minimum GPA of 3.0 required. (3H,3C)

2964: FIELD STUDY
X-grade allowed. (3H,3C)

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3044: PRIVATE CLUB MANAGEMENT
Develop an understanding of the private club sector of the hospitality industry. Topic areas are divided into club fundamentals, revenue-generating operations within clubs and support functions/departments of club operations. Junior standing as well as background courses in basic financial management are suggested. (3H,3C)

3114: SPECIAL TOPICS IN HOSPITALITY AND TOURISM STUDIES
Variable content that addresses timely and complex issues of the hospitality and tourism industry from a variety of disciplines or intellectual domains.

This course provides HTM students with knowledge that is not formally part of the curriculum. Students will learn from the structured learning experience and knowledge domain developed by the faculty offering the course. May be repeated up to five times, for a maximum of 15 credit hours with different content. Pre: 1414 or 2454 or 2464. (3H,3C)

3414: PURCHASING, PRODUCTION, AND MANAGEMENT
Purchasing, preparation, service, and management of a large quantity food service operation. Opportunity is given for administration of the departmental cafeteria. X-grade allowed. (2H,6L,4C) I,II.

3444: FINANCIAL MANAGEMENT AND COST CONTROL FOR HOSPITALITY ORGANIZATIONS
The application of accounting, finance, and cost control principles to hospitality industry organizations. The focus if this course is to provide future food service and lodging organization managers with the ability to handle the unique problems regarding financial analysis and cost control in this industry. Pre: FIN 3104. (3H,3C) I,II.

3454: TOURISM ANALYSIS
Different aspects of tourism, including origin and destination flow models, tourism destinations and their attractiveness, impacts of tourism, tourist profiles and destination decisions, demand/supply interaction, and barriers to travel are explored and analyzed. (3H,3C)

3464: HOSPITALITY AND TOURISM RESEARCH METHODS I
An introduction to the various research methods and techniques which would be most appropriate in the analysis of problems in the hospitality field. The basic concepts of the scientific process and the foundation of research, research design, data collection techniques, sampling issues, statistical techniques and the analysis and reporting of data will be studied. Pre: STAT 2004 or BIT 2405. (3H,3C)

3474: HOSPITALITY FACILITIES PLANNING AND MANAGEMENT
Layout and design for efficient management of hospitality facilities. Organization and management of a facilities maintenance system and preventive maintenance and energy management programs. Junior Standing. (3H,3C) I,II.

3484: SOCIO-CULTURAL IMPACTS OF TOURISM
A study of both historic and current socio-cultural impacts of tourism on family, community, culture, government, and the environment. The course examines the ways in which tourism has both affected and been affected by modern society worldwide. (3H,3C)

3524: LODGING MANAGEMENT
Organization, function, and management of lodging operations. (1H,6L,3C) I,II.

3534: LEGAL ASPECTS OF HOTEL, RESTAURANT, AND INSTITUTIONAL MANAGEMENT
Examination of laws and regulations which exert control on the food service and lodging industry. The focus of the course is preventive legal management with major emphasis placed upon recent litigation. (3H,3C) I,II.

3954: HTM STUDY ABROAD
This course provides students with an international hospitality and tourism management business experience. Students will be required to apply their knowledge and skills from their Pamplin College of Business core courses within this course. Students will learn from the structured educational experience developed by the faculty directing the study abroad program. Pamplin College of Business majors must have been approved for upper division course-work. Variable credit course.

4414: FOOD AND BEVERAGE MANAGEMENT
Organization, administration, and operation of food service operations. Opportunity is provided for administration of the departmental cafeteria. X-grade allowed. Pre: 3414. (3H,3C) I,II.

4424: EVENTS MANAGEMENT
Management of special events in the hospitality and tourism industry. Students will explore organizational functions necessary for producing special events, as well as analyzing the factors that influence an event's success, such as organizational structure, risk management and the impact of tourism activity. Junior standing in HTM is required. (3H,3C)

4444: WINERY TOURISM
The course focuses on the role of wine and wineries in tourism, wine marketing and management in the hospitality industry, and examines the components of a winery. Students must be 21 years of age due to the inclusion of wine tasting in the course. (3H,3C)

4454: HOSPITALITY MARKETING MANAGEMENT
Application of marketing principles and practices for the specialized needs of the hospitality industry. Pre: MKTG 3104. (3H,3C) I,II.

4464: HUMAN RESOURCES MANAGEMENT IN THE HOSPITALITY INDUSTRY
An overview of the concepts of human resources management as applied to the specific environments within the hospitality industry. (3H,3C) I,II.

4534: HOSPITALITY MANAGEMENT POLICY
Integrates business principles and practices related to hospitality management. Cases involving hospitality industry organizations are analyzed extensively. Senior standing required. Pre: 3444, 3524. Co: 4414, 4464, 4454. (3H,3C) I,II.

4604: SEMINAR IN HOTEL, RESTAURANT AND INSTITUTIONAL MANAGEMENT
(1H,1C)

4964: FIELD STUDY IN HTM
X-grade allowed.
(3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

Management

http://www.management.pamplin.vt.edu/

Anju Seth, Head
Digges Professor of Entrepreneurship: S. E. Markham
Pamplin Professors of Management: A. Seth; R. E. Wokutch
Strickler Professor of Entrepreneurial Studies: J. R. Lang
Pamplin Professor of Management: A. Seth; R. E. Wokutch
Professors: M. K. Badawy; T. W. Bonham
Associate Professors: J. B. Arthur; K. D. Carlson; A. T. Cobb; J. L. French; D. R. Gnyawali; D. E. Hatfield; K. F. Murrmann; W. J. Smith; L. F. Tegarden
Assistant Professors: O. Bruyaka; S. F. Gove; T. N. Phillips
Instructors: L. C. Borny; M. Deck; R. B. Kennedy
Adjunct Instructor: W. D. Miller
Affiliated Faculty: M. Singal
Emeritus Faculty: R. M. Madigan; J. F. Robinson; M. C. Schnitzer; J. M. Shepard; C. U. Stephens
Career Advisor: L. C. Borny
Business Leadership Center Director: J. R. Lang
Business Diversity Center Director: Staff
Small Business Institute Director: R. B. Kennedy

Overview

The curriculum in Management is a solid foundation for a wide variety of future business careers. It is unique within the Pamplin College of Business because it fosters an integrated perspective of business enterprises. Course work in the traditional functional areas (accounting, operations, finance, marketing, information technology) is coupled with a choice of one of two Management nine-hour options: I) Entrepreneurship, Innovation and Technology Management, or II) Human Resource Management. Students in Management are also eligible to participate in the Department of Management's Leadership minor and Business Diversity minor.

Our curriculum emphasizes the development of versatile skills that are essential to achieve organizational goals: cross-functional thinking, analytical problem-solving, leadership, team work, communication skills, and ethical decision-making.

The capability to manage across functions is of paramount importance in the modern-day business enterprise. Our curriculum enables students to understand how the separate business functions can be integrated to achieve a single, coordinated effort, especially in complex, technologically-based enterprises.

Tomorrow's managers must be able to lead themselves, other individuals, and teams. Students are exposed to state-of-the-art ideas and practices regarding leadership, and are given multiple opportunities to develop their interpersonal skills while applying this knowledge in team projects. Because effective communication is an essential component of organizational leadership, strong emphasis is placed on development of written and oral communications skills.

Increasingly in the modern business world, organizational success depends upon actions taken in situations requiring complex ethical judgments. Therefore, a concern for ethics is infused in courses throughout the Management curriculum.

In addition to fulfilling the Pamplin College of Business requirements for the first two years and the college core course requirements, all Management majors must 1) meet these specific Management major course requirements, and 2) choose one of two options of concentration.

Required Courses:
ACIS 2504: Personal Computers in Business
MGT 3324: Organization Behavior
MGT 3334: Introduction to Human Resource Management
MGT 4334: Ethical Leadership and Corporate Social Responsibility

MGT 4344: Productivity and Quality Leadership

Option I: Entrepreneurship, Innovation & Technology Management
This option prepares students to take an entrepreneurial approach to managing in any organizational context, including large organizations as well as new startups. It is also suitable for students who intend to run their own businesses. Three additional courses are required for those students selecting this option:
MGT 3604: E-Management: Concepts and Skills
MGT 4064: Innovation, Technology and Entrepreneurial Leadership
MGT 4074: Applied Small Business Consulting

Option II: Human Resource Management
This option prepares students for a career in the human resources management area. It is also well suited for those students who wish to build their people management skills to complement their skills in other functional areas. Three additional courses are required for those students selecting this option:
MGT 3344: Labor-Management and Employee Relations
MGT 3424: Human Resource Staffing and Development
MGT 4414: Compensation and Performance Management

Leadership Minor

The Leadership minor provides a multi-disciplinary, experiential background in the history, values, skills and theory of leadership. It provides the student with the opportunity to tailor his/her leadership education and experience to personal and career needs.

The curriculum consists of eighteen (18) credit hours of study, including six (6) hours of electives and three (3) hours of experiential activity.

Required Courses
MGT 3304: Management Theory and Leadership Practice
MGT 4334: Ethical Leadership and Corporate Social Responsibility
MGT 4354: Leadership: Advanced Skills and Concepts

Elective Courses
Students may select six (6) credit hours of electives from the following areas, according to their interests:
Global/Multicultural Perspectives:
SOC 2024: Minority Group Relations
SOC 3614: Gender and Work in the U.S.
MGT 4314: International Management
Communication Skills:
COMM 2074: Introduction to Mass Communication
COMM 3124: Interpersonal Communication
COMM 4064: Persuasion
HUM/COMM 3204: Multicultural Communication

Experiential Activity
An experiential activity may take the form of a formal three-credit course or an independent study which offers significant leadership and/or service experience consistent with the goals of the minor.

Business Diversity Minor

The Business Diversity Minor provides students with an informed perspective of diversity issues prevalent in the workplace. Students will learn how to manage a diverse workforce with increased awareness, knowledge, and skills while also learning about the business case for diversity.

Required Courses
Must take both courses:
MGT 3434: Diversity in the Workplace: Issues for Individuals
MGT 3444: Diversity in the Workplace: Issues for Organizations

Additional Required Courses
Select one of the following:
HTM 3484: Socio-cultural Impacts of Tourism
MKTG 4644: Marketing, Society and the Public Interest

Select one of the following:
MGT 4234: Ethical Issues in Business Diversity
FIN 4024: Legal Aspects of a Diverse Workplace

Elective Courses

Select one of the following:
AFST 1714: Introduction to Africana Studies
AFST/REL 2144: African Religions
AFST 2354: The Civil Rights Movement
AFST 2454: Race and Racism
AFST/REL /WS 2734: The Black Woman in the U.S.
AFST/REL 2744: The Black Church in America
AFST/HIST 3176: Afro-American History
AFST 3454: African American Leadership
AINS/HUM 1104: Introduction to American Indian Studies
AINS/HUM 4004: Special Topic (as appropriate)
ECON 3014: Economics of Poverty
ENGL 2524: Introduction to Ethnic American Literatures
HUM 1704: Introduction to Appalachian Studies
HUM 1924: Exploration of Modern Asian Cultures
HUM/COMM 3204: Multicultural Communication
HUM 4104: Explorations in Advanced Humanities Topics
HUM 4404: Appalachian Folk Culture
PSCI 3255 or 3256: The Politics of Race, Ethnicity, and Gender
REL 1014: Asian Religions
REL 1024: Judaism/Christianity/Islam
REL 1034: Religion and the Modern World
REL 3214: Religion and Culture in India
REL 3224: Religions of China and Japan
SOC 2024: Minority Group Relations
SOC 2514: Appalachian Social Issues
SOC 3014: Gender Relations
SOC 3614: Gender and Work in the U.S.
SOC 3714: Sociology of Aging
SPAN/HUM 2754: Introduction to Spanish-American Culture and Civilization
WS 1824: Introduction to Women's Studies
WS 2224: Women and Creativity
WS 2264: Race, Class, and Gender

Required Experiential Activity
Select one of the following:
MGT 2964 or 3964 or 4964: Field Study
MGT 3464: Diversity-Related Internship and Professional Dev.

Undergraduate Course Descriptions (MGT)

1004: INTRODUCTION TO BUSINESS
Introduction to the role of the free enterprise system in society and economy. Study of the various business functions such as economic trends, accounting, finance, management, marketing, and production and operations. Analysis of these functions for programs of study and for career opportunities. Restricted to freshmen and sophomores. (2H,2C)

2944: MILITARY LEADERSHIP PRACTICUM
Progressive leadership education, training and development through readings, lectures, exercises and leadership positions within the Corps of Cadets. Emphasis of this course is on the day-to-day implementation of leadership strategies and tactics in a military environment. Topics include leadership theory and practice, honor and ethics education, and professional integrity. Exercises include small group discussion, leadership scenarios, and role-playing. Each cadet will perform at least one leadership position to include team leader, cadre, squad leader, platoon leader, company commander, or primary/special staff positions. May be taken up to 8 times. Pass/Fail only. (1H,1C)

2954: BUSINESS STUDY ABROAD
This course provides students with an international business experience. It is only offered as part of a program outside of the United States. Students will learn from the structured educational experience developed by the faculty leader. This course is intended for students who want to develop management-related free electives. Pre: Instructor's consent and the completion of 24 semester hours with a minimum GPA of 3.0 or departmental consent. Variable credit course.

2964: FIELD STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3304: MANAGEMENT THEORY AND LEADERSHIP PRACTICE
This survey course introduces the student to a broad range of concepts, theories and practices important for a basic understanding of management. Topics also focus on the environment in which today's managers must effectively operate. Junior standing required. (3H,3C)

3314: INTERNATIONAL BUSINESS

The course provides a framework to show how a firm's international business operations can be analyzed, understood, and undertaken, including discussion of cultural, social, political, and economic aspects of doing business abroad. The main learning experience in the course is oriented toward effective decision-making in the face of unique challenges faced by managers in the international business environment, with the goal of improving critical, analytical and creative thinking skills in international business operations. Junior Standing Required. (3H,3C)

3324: ORGANIZATION BEHAVIOR
This course examines the determinants and consequences of human behavior in formal organizations. Specific focus is on the individual, interpersonal, and group processes which underlie all the human dynamics. Pre: 3304. (3H,3C)

3334: INTRODUCTION TO HUMAN RESOURCE MANAGEMENT
This course examines the strategies, policies, and practices associated with effective human resource management and employee/labor relations in public- and private-sector organizations in both union and nonunion settings. This course is designed for future managers and emphasizes the acquisition, development, reward, and retention of employees within a legal and social context of today's organizations. Junior standing is required. Co: 3304. (3H,3C)

3344: LABOR-MANAGEMENT AND EMPLOYEE RELATIONS
An examination of labor and employee relations policies and practices from an economic, behavioral and legal viewpoint. Examines contemporary methods of employee organization, labor-management cooperation, representation and dispute resolution in private and public, and union and non-union work settings in the United States and selected other countries. Pre: 3304, 3334. (3H,3C)

3424: HUMAN RESOURCE STAFFING AND DEVELOPMENT
Concentrates on the acquisition, deployment, and development of human resources within organizations. This course emphasizes the design and implementation of staffing, training, and development processes to achieve organizational objectives within social and economic constraints. Pre: 3304, 3334. (3H,3C)

3434: DIVERSITY IN THE WORKPLACE: ISSUES FOR INDIVIDUALS
Examines the individual perspectives of diversity on the work experience, and is designed to prepare individuals to meet the challenge of all aspects of diversity in organizations. Attention is given to how gender, race, ethnicity, religion, age, disabilities, social class, sexual orientation, culture, tradition, education, economic structure, and organizational philosophy interact to create a set of rules for acceptable behaviors in complex organizations. (3H,3C)

3444: DIVERSITY IN THE WORKPLACE: ISSUES FOR ORGANIZATIONS
Examines the impact of diversity on organizational performance. The ability to relate to people on every level is critical to business success. Accountability for diversity-related efforts and outcomes, diversity metrics, including ROI for diversity management, and making diversity a bottom-line necessity will be discussed. Pre: 3434. (3H,3C)

3464: DIVERSITY-RELATED INTERNSHIPS AND PROFESSIONAL DEVELOPMENT
Guided experience in a diverse work environment. Through a paid or unpaid internship, students will have the opportunity to experience diversity within an organization first hand while working on organizationally meaningful assignments in the classroom. Pass/Fail only. Pre: 3434. (1H,6L,3C)

3604: E-MANAGEMENT: CONCEPTS AND SKILLS
This course provides cutting edge experiences, skills, and knowledge for management majors and other College of Business e-commerce students who are concerned with the digital transformation of business. Within a context that examines fundamental changes in management due to the Internet Revolution which are as dramatic as the Industrial Revolution, three themes will be pursued: (1) how these organizations are different from traditional organizations, (2) new implications for knowledge sharing, knowledge management, and communication, and (3) e-based techniques for leadership practices. Pre: 3304, ACIS 2504. (3H,3C)

3754: MANAGEMENT INTERNSHIP AND CAREER DEVELOPMENT
Guided experience in work environments and job search. Through unpaid internships, students have the opportunity to view the inner workings of businesses first hand while working on organizationally meaningful assignments. Class activities prepare students for conducting effective job searches. Pass/Fail only. Pre: 3304. (1H,6L,3C)

3954: STUDY ABROAD
Variable credit course.

3964: FIELD STUDY
Variable credit course.

4064: INNOVATION, TECHNOLOGY AND ENTREPRENEURIAL LEADERSHIP
This course examines the leader's role and required skills for new venture creation and fostering innovation and technology development. Partially duplicates AAEC/MGT 3454. Senior standing in the Pamplin College of Business required. Pre: 3304. (3H,3C)

4074 (MKTG 4074): APPLIED SMALL BUSINESS CONSULTING
Application of accounting, finance, marketing, management, information technology, and management science concepts to small business cases. On-site consultation with existing firms. Through the experiential studies, students will explore the role of 'pro bono' work in the management field. Pre: Pamplin College of Business senior or graduate standing. Permission of instructor is required for students outside the Pamplin College of Business. Pre: 3304. (3H,3C)

4104 (FL 4104): GLOBAL CULTURE
This course will examine problems of cultural differences using an interdisciplinary approach combining business studies with cultural studies in the humanities and social sciences. It will address issues related to living and working with people from other countries or cultures, whether domestically or abroad. It will also explore the impact of globalization on various aspects of culture. Junior standing required. (3H,3C)

4234: ETHICAL ISSUES IN BUSINESS DIVERSITY
This course examines underlying ethical issues involved with operating in a diverse business environment with respect to gender, race, religion, age, social class, sexual orientation, culture, tradition, and education. Ethical decision making frameworks including rights-based ethics, duty-based-ethics, utilitarianism, justice, and virtue ethics as well as the concepts of corporate social responsibility and corporate citizenship are introduced and applied to issues of diversity. Competence in the application of these frameworks to diversity issues is developed through analysis of cases and experiential activities. Pre: 3304, 3434. (3H,3C)

4314: INTERNATIONAL MANAGEMENT
The course is designed to provide the student with familiarity concerning the unique problems, characteristics, and demands that face multinational managers and the international business community. Junior standing required. (3H,3C)

4324 (PHIL 4324): BUSINESS AND PROFESSIONAL ETHICS
An inquiry into the fundamental norms of conduct in business and other professions and their justification in relation to the most important ethical theories. Special attention will be given to moral problems such as the ethics of hiring and firing, bribery, and professional responsibility to society. (3H,3C)

4334: ETHICAL LEADERSHIP AND CORPORATE SOCIAL RESPONSIBILITY
The leadership role of managers in promoting ethics and corporate social responsibility in business today. Consideration of business-society issues such as environmental pollution, employee rights and responsibilities, discrimination/affirmative action, and the activities of multinational corporations. These issues will be examined through the conceptual frameworks of business ethics and corporate social responsibility. Pre: 3304. (3H,3C)

4344: PRODUCTIVITY AND QUALITY LEADERSHIP
This course provides an introduction to leadership in the context of productivity and quality improvement. It focuses on understanding the concepts and skills associated with contemporary management strategies and systems. This course requires active student involvement and emphasizes participative leadership skills, data collection, qualitative problem solving, and communication processes. For Management majors only. Senior standing required. Pre: 3304, 3324, BIT 3414. (3H,3C)

4354: LEADERSHIP: ADVANCES IN SKILLS AND CONCEPTS
This cornerstone course provides cutting-edge experiences, skills, and knowledge in leadership for students in the leadership minor. Within an historical context that balances military, political, and business perspectives, four types of leadership will be examined: self-leadership, dyadic leadership, team leadership, and enterprise leadership. Special emphasis will be placed on the specific skills, such as computer literacy and project management, required for leaders to succeed in modern, technologically oriented organizations. Pre: senior standing. Pre: 3304. (3H,3C)

4394: BUSINESS POLICY AND STRATEGY
Integrates business principles and practices covered in basic courses. Cases used extensively. Senior standing required. Pre: 3304, (MKTG 3104 or MKTG 3104H), FIN 3104, FIN 3055, BIT 3414. (3H,3C)

4414: COMPENSATION AND PERFORMANCE MANAGEMENT
This course provides the knowledge and skills required by managers to design and implement comprehensive compensation and performance management systems in public and private organizations. Topics include development of compensation strategy, internal pay structure, determination of pay level through wage surveys, evaluating job performance, rewarding individuals and groups, and
administering employee benefits. Pre: 3304, 3334. (3H,3C)

4764: APPLIED HUMAN RESOURCE INFORMATION SYSTEMS
The study of how human resource information systems (HRIS) can and should be applied in organizations to support organization strategy, improve efficiency and flexibility, increase productivity, and improve the quality of work life for all employees. Pre: 3334. (3H,3C)

4864: WI UNDERGRADUATE RESEARCH
Variable credit course.

4874: WI INDEPENDENT STUDY
Variable credit course.

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

Pamplin College of Business

Marketing

http://marketing.cob.vt.edu/

Kent Nakamoto, Head
Robert O. Goodykoontz Professor of Marketing: D. Brinberg
R. B. Pamplin Professor of Marketing: K. Nakamoto
Professors: E. F. Fern; J. E. Littlefield; M. J. Sirgy; J. L. Ozanne
Associate Professors: E. Coupey; N. M. Klein
Assistant Professors: E.I. Chandon; K. Weaver; Y. Zemack-Rugar
Visiting Assistant Professor: J. Machin
Emeritus Faculty: M.M. Bird; J. E. Keith
Director, Undergraduate Programs: D. Rieley (231-5759)

Overview

Marketing consists of the spectrum of activities that join production of goods and services with the consumer or industrial user. Marketing management consists of planning, implementing, and controlling marketing activity. Included among these activities are such things as helping to design products or services to satisfy customers' needs, designing pricing strategies to achieve profitable utilization of resources, implementing distribution procedures to obtain a smooth flow from production to use, and evaluating the personal selling and advertising operations to assure that users have sound bases for their buying choices. Marketing management is closely affiliated with such social and behavioral sciences as economics, sociology, and psychology, as well as such quantitative disciplines as accounting, statistics, management science, and computer science.

The undergraduate program in marketing management is designed to offer the student a broad business education with an emphasis on professional training for development of marketing strategies and managing marketing operations. Numerous specializations are afforded by the field. First, the market for goods in the private sector divides itself into two major parts: the consumer market and the industrial market. Specialization in either market can be easily accomplished in the marketing program by selection of electives. Other specializations may be achieved by the same procedure.

In addition to the undergraduate program, the faculty in marketing management offer a master's and a doctoral degree for those students interested in more technical positions, such as marketing research; more rapid promotion with certain employers; or positions in higher education.

The department participates in the Cooperative Education Program in which qualified students may alternate semesters of study with semesters of professional employment.

Requirements

In addition to fulfilling the college of business requirements for the first two years and the junior and senior core course requirements, each student must meet the following course requirements:

MKTG 3154: Marketing Skills	(3)
MKTG 4154: Marketing Research	(3)
MKTG 4204: Consumer Behavior	(3)
MKTG 4304: Marketing Communications	(3)
MKTG 4354: Marketing Channels and Logistics	(3)
MKTG 4554: Relationships Among Buyers and Sellers	(3)
MKTG 4754: Strategic Marketing	(3)
Plus any two of the following:	
MKTG 3504: Advertising	(3)

MKTG 3604: Professional Selling	(3)
MKTG 4074: Small Business Consulting	(3)
MKTG 4254: Product and Price Management	(3)
MKTG 4404: Field Practicum in Marketing	(3)
MKTG 4454: Sales Force Management	(3)
MKTG 4504: Marketing and the Internet	(3)
MKTG 4564: Marketing for High Technology Products	(3)
MKTG 4604: Retail Management	(3)
MKTG 4704: International Marketing	(3)
MKTG 4734: Real Estate Marketing	(3)

Undergraduate Course Descriptions (MKTG)

2954: BUSINESS STUDY ABROAD
This course provides students with an international business experience. It is only offered as part of a program outside of the United States. Students will learn from the structured educational experience developed by the faculty leader. This course is intended for students who want to develop marketing-related free electives. Pre: Instructor's consent and the completion of 24 semester hours with a minimum GPA of 3.0 or departmental consent. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

3104: MARKETING MANAGEMENT
Study of the marketing process from a macro and management viewpoint. The macro viewpoint includes the role of marketing in society. The management viewpoint includes the product, distribution, promotional, and pricing decisions. Junior standing required. (3H,3C) I,II,III,IV.

3104H: MARKETING MANAGEMENT
(3H,3C)

3504: ADVERTISING
Survey of advertising principles and its applications. The course covers advertising history, the impact of advertising on society, and ethical and regulatory issues. The process of creating and placing advertising is explored including advertising objectives, budgeting, media planning and mix, creative objectives and strategy, copy execution and production, and copy testing. Junior standing required. Pre: 3104. (3H,3C)

3954: STUDY ABROAD
Variable credit course.

4074 (MGT 4074): APPLIED SMALL BUSINESS CONSULTING
Application of accounting, finance, marketing, management, information technology, and management science concepts to small business cases. On-site consultation with existing firms. Through the experiential studies, students will explore the role of 'pro bono' work in the management field. Pre: Pamplin College of Business senior or graduate standing. Permission of instructor is required for students outside the Pamplin College of Business. Pre: MGT 3304. (3H,3C)

4144 (CHE 4144): BUSINESS AND MARKETING STRATEGIES FOR THE PROCESS INDUSTRIES
Business strategies and industrial marketing concepts, and their application in the chemical, pharmaceutical and related process industries. The course is designed for engineers and other students planning a career in the process industries. Junior standing required. (3H,3C)

4154: MARKETING RESEARCH
This course is a study of the scientific process of problem solving in a marketing context. It includes concepts of problem definition, hypotheses generation, questionnaire development, research design, implementation, analysis, and interpretation of statistical findings. Junior standing required. Pre: BIT 2405, BIT 2406. Co: 3104. (3H,3C)

4204: CONSUMER BEHAVIOR
An integrated analysis of individual and environmental influences on consumer decision making, purchase, and consumption behaviors with strong emphasis on implications for developing, executing, and assessing marketing strategy. Junior standing required. Pre: 3104 or 3104H. (3H,3C)

4254: PRODUCT AND PRICE MANAGEMENT
Strategic product planning and new product development are discussed within the context of marketing management. Economic, financial, legal, and marketing principles are integrated to analyze pricing decisions. Behavioral implications of pricing also are considered. Relationships between product and price management address. Junior standing required. Pre: 3104. (3H,3C)

4304: MARKETING COMMUNICATIONS
Theory and application of an organization's marketing communications function. Content will include developing a marketing plan, setting communication goals, developing message strategy, implementing the strategy using promotional mix variables, planning media, and determining the communication budget. Junior standing required. Pre: 3104 or 3104H. (3H,3C)

4354: MARKETING CHANNELS AND LOGISTICS
Management of the firm's distribution function. Study of the structure, functions, interactions, and activities of marketing channels. Analysis and development of integrated physical distribution and logistics systems for the firm. Junior standing required. Pre: (3104 or 3104H), BIT 2405, BIT 2406. (3H,3C)

4404: FIELD PRACTICUM IN MARKETING
Application of marketing concepts and theories to a specific business concept. On-site performance of marketing activities and a written analysis of the firm's marketing strategy and execution. Junior Standing Pre: 3104. (3H,3C)

4454: SALES FORCE MANAGEMENT
Integration of behavioral research to provide an understanding of the role of the salesperson within the sales organization and in relation to the buyers. Personal selling examines the dyadic interaction between buyer and seller. Managing the sales force covers planning, organizing, directing, and controlling the activities of the sales personnel. Junior standing required. Pre: 3104, 4554. (3H,3C)

4504: MARKETING AND THE INTERNET
Develop and implement theoretical and practical approaches to marketing strategy that leverage the information technologies of the Internet. Topics include the characteristics of the Internet as a marketing environment; perspectives of agents (e.g., consumers, marketers, technologists) within the Internet environment, and implications of the Internet for strategic marketing and marketing management. Pre: 3104. (3H,3C) II.

4554: RELATIONSHIPS AMONG BUYERS AND SELLERS
Management of relationships between buyers and sellers among marketing organizations. Organizational buying, personal selling, and relationship marketing. The buying center and buying roles, the buying situation, the purchasing role, the sales process, personal selling approaches, negotiation, power and dependence, conflict resolution, and relational exchange. Pre: 3104 or 3104H. (3H,3C) I, II.

4564: MARKETING FOR HIGH TECHNOLOGY PRODUCTS
This course covers the unique nature of marketing high technology. It applies the basic elements of marketing strategy -- market segmentation and targeting, marketing mix elements -- to the context of high technology goods and services. It also addresses the development of effective strategic, marketing plans for high technology products. Pre: 3104. (3H,3C) I.

4604: RETAIL MANAGEMENT
Analysis of managerial problems in retailing establishments. Focus is on operational problems, retail store organization, location analysis, buying, selling, sales promotion, and merchandise handling. Junior standing required. Pre: 3104 or 3104H. (3H,3C)

4644: MARKETING, SOCIETY AND THE PUBLIC INTEREST
The impact of marketing on society from a multi- disciplinary and multi-stakeholder perspective. Marketing's role in solving societal problems is explored. Topics include at-risk market segments, controversial products and practices, and issues of social justice. Pre: 3104 or 3104H. (3H,3C)

4654: DEMAND ANALYSIS AND FORECASTING
Survey of techniques employed in forecasting sales and other marketing variables. Analysis of the performance of marketing on various criteria. Pre: 3104, BIT 2405, BIT 2406. (3H,3C)

4704: INTERNATIONAL MARKETING
Assessing international markets, comparing marketing systems; management of international marketing operations; focusing on distribution, promotional, and pricing problems faced by firms engaging in world trade. Junior standing required. Pre: 3104 or 3104H. (3H,3C)

4734: REAL ESTATE MARKETING
This course extends the fundamental concepts of marketing into the study and practice of real estate. The course is concerned with the topics of demographic analysis, market information systems, market research, and marketing strategy of residential and commercial real estate, with particular emphasis on the important area of real estate personal selling. Junior standing required. (3H,3C)

4754: STRATEGIC MARKETING
An integrative course in marketing policy and strategy, employing comprehensive case problems in the formulation of marketing action programs and business policy. Senior standing required. Any one of the following Marketing prerequisites--4304, 4354, 4554--may be taken concurrently with 4754. Pre: (3104 or 3104H), 4154, 4204. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

4994H: HONORS UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Science

www.science.vt.edu/

Dean, Lay Nam Chang
Associate Dean for Curriculum, Instruction and Advising: Jill Sible
Associate Dean for Administrative and Faculty Affairs: Jack Finney
Associate Dean for Research, Graduate Studies and Outreach: Nancy Ross
Assistant Dean for Undergraduate Studies: Jerry W. Via

Overview

The College of Science at Virginia Tech gives students strong training in analytical skills and a comprehensive foundation in the scientific method. Outstanding faculty members conduct research and teach courses in nine disciplines leading to baccalaureate and advanced degrees. Coursework from the College of Science also provides a foundation of knowledge of a number of fundamental subjects for students in all colleges. The College of Science also offers academic advising and appropriate preparatory coursework for students interested in pre-medicine, pre-dentistry, pre-veterinary medicine and patent or intellectual property law.

Students may major in the following disciplines:

Biochemistry	Biological Sciences	Chemistry
Economics	Geosciences	Mathematics
Physics	Psychology	Statistics

In addition to traditional majors, the college offers programs in nano-scale science and technology as well as information science, and supports research centers--in areas such as biomedical and public health sciences, and critical technology and applied science--that encompass other colleges at the university. Allied disciplines emphasize the study of behavioral science as well as economic and strategic decision making. The college is committed to providing research opportunities for interested students at all levels.

Degree Programs

Specific degree programs include:

- Biochemistry (B.S.; options in Biochemistry and Biotechnology)
- Biological Sciences (B.S.; options, Biotechnology, Microbiology/Immunology)
- Chemistry (B.S. or B.A.)
- Economics (B.A.; specializations in Business Economics, Macroeconomics and Finance, Economic Theory, Econometrics and Empirical Economics and Public Policy)
- Geosciences (B.S.; options in Geology, Geochemistry, Geophysics and Earth Science Education)
- Mathematics (B.S.; options in Traditional Mathematics; Applied and Computational Mathematics; Applied Discrete Mathematics and Mathematics Education)
- Physics (B.S. or B.A.)
- Psychology (B.S.)
- Statistics (B.S.)

The college offers minors in all of the majors listed above. A leadership minor is available to members of the Corps of Cadets. Students are encouraged to include a minor in their program and should consult an advisor for help in choosing one that will advance their career goals.

General Requirements for Graduation

A student in the College of Science must complete at least 120 hours for an undergraduate degree as well as satisfying the following requirements:

- achieve a minimum overall Grade Point Average (GPA) of 2.0 for all hours attempted
- achieve a minimum overall GPA of 2.0 for all hours attempted in all work applied to the major
- complete all other requirements established for their degree by the major department
- complete all college and Curriculum for Liberal Education requirements

No course required for graduation or in the major/minor may be elected to be taken on a pass/fail basis (i.e., pass/fail may be used for free electives only). This excludes courses that are offered P/F only.

College Core Curriculum

A description of the Curriculum for Liberal Education may be found in the Academics chapter of this catalog or on the Curriculum for Liberal Education website (http://www.cle.prov.vt.edu/). College Specific Requirements related to the Curriculum for Liberal Education (CLE):

Area 6: Creativity and Aesthetic Experience

- Satisfactorily complete a three credit hour course approved for the university core curriculum. (The one-credit courses for the CLE will not fulfill this requirement.)

Foreign Language: Must complete the third year (level III) of a single foreign language (including Sign Language) in a secondary school. This requirement may also be fulfilled by successful completion of one of the following:

- Satisfactorily complete 1106 for any foreign language offered including any prerequisites
- Satisfactorily complete an accelerated course which combines 1105 and 1106 of a foreign language
- Students who have not completed two (2) units of a single foreign language in high school must satisfactorily complete 1106 or an accelerated course which combines 1105 and 1106 of a foreign language. These hours are in addition to the 120 hours required for graduation, so these hours will not count towards graduation.
- Credit by examination for a foreign or classical language. The credit by examination option is available only to students who have gained knowledge of a foreign language without the benefit of formal training. This privilege is intended to recognize informal, non-academic learning experience. This option is restricted and does not carry credit towards graduation. Requests must be made through the Foreign Language office. See http://www.collegeboard.com/student/testing/clep/about.html for available tests and procedures.
- Students whose native language is not English may be exempted from the foreign language requirement through demonstrating satisfactory knowledge of the foreign language as prescribed by the Department of Foreign Languages and Literatures. All requests for exemption should be addressed to and must be approved by the head of the Department of Foreign Languages and Literatures. This option does not carry credit towards graduation.

Satisfactory Progress

In addition to the university and to the departmental criteria (see specific departments in this chapter), all students in the College of Science are evaluated for continued enrollment at Virginia Tech. The two College of Science criteria for satisfying progress toward degree state that:

1) Students who have attempted 72 semester hours must have completed their foreign language requirement by the close of the academic year (Spring Semester), and 2) Students must have completed all credits for the Curriculum of Liberal Education by the time 96 semester hours have been attempted.

The Honors Program

The University Honors Program is available to students in the College of Science. These programs provide an enriched environment for qualified students who are highly motivated and possess outstanding scholastic ability. Specific requirements for the three possible honors degrees are available from the honors program and participating departments.

Students who have GPAs of at least 3.5 are also eligible to apply for Five-Year BA/MA degrees in Chemistry, Economics and Physics and Five-Year BS/MS degrees in Biochemistry, Biological Sciences, Geosciences, Mathematics and Statistics.

Dean's List

A student enrolled in the College of Science for 12 hours or more for grade (A-F) who earns a GPA of 3.4 or higher during the fall or spring semesters is awarded a Dean's List certificate.

Pre-Professional Advising in the College of Science

The College of Science provides pre-professional career advisors for all disciplines. Pre-dentistry, pre-medicine, and pre-veterinary medicine advisors are available in the biochemistry, biological sciences, chemistry, and psychology departments. Advising for students interested in patent or intellectual property law careers is available in the college advising center. The College of Science offers a program in patent and intellectual property law in cooperation with the University of Richmond Law School.

Dentistry, Medicine, Veterinary Medicine: Students preparing for these fields customarily complete the biochemistry, biological sciences, or chemistry curriculum.

Law: Students interested in patent or intellectual property law need a major or two minors in biochemistry, biological sciences, chemistry, geosciences, physics or engineering. Other law specialties are open to students in all majors.

Pharmacy: Students preparing for pharmacy customarily enter the biochemistry, biological sciences, or chemistry curriculum.

Phi Beta Kappa

Phi Beta Kappa is the oldest and most prestigious honor society dedicated to recognizing excellence in the liberal arts and sciences. Students in the College of Science who have exhibited outstanding academic ability in eligible coursework may be eligible for election to Phi Beta Kappa.

Scholarships

A number of scholarships are available for outstanding students enrolled in the College of Science. Descriptions and deadlines are available on the Scholarships and Financial Aid website.

Undergraduate Research

Research experience can play an important part in undergraduate training in science. College of Science departments have a variety of research opportunities in which students may choose to participate. Individuals interested in undergraduate research should contact the department where they wish to conduct research for details.

Internships, Co-op Opportunities and Enrichment Programs

Students are encouraged to participate in Internship and Co-op opportunities to gain relevant work experience prior to graduation. Career advisors in the college advising center as well as departmental career advisors can help students identify opportunities. In some cases, students can receive credit for qualifying work experience. Enrichment studies include field station opportunities, study abroad and summer laboratory experiences outside of the university.

Career Advising

Career advising is available from a number of sources. The university offers centralized career services and on-campus interviewing. The College of Science works with employers interested in hiring students with degrees from the college and organizes employer panels and information sessions. The college also co-hosts two career fairs each year, one in the fall semester and one in the spring semester. Every major has a departmental career advisor who specializes in guiding students from their field towards career success. Information about upcoming events is available at www.science.vt.edu/career/.

Graduate Programs in Science

College of Science departments all offer graduate degrees at both the Master's and Ph.D. levels. Complete information on these programs including descriptions of graduate courses can be found in the Graduate Catalog.

Undergraduate Course Description

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

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College of Agriculture and Life Sciences
College of Science

Biochemistry

www.biochem.vt.edu/

P. J. Kennelly, Head
Professors: J.-S. Chen; D. R. Dean; P. J. Kennelly; T. J. Larson; W. E. Newton; M. Potts; Z. Tu
Associate Professors: D. R. Bevan; E. L. Dolan; G. E. Gillaspy; E. M. Gregory; R. F. Helm; J. Li; T. O. Sitz; R. H. White
Assistant Professors: M. Hernick; M. W. Klemba; P. Sobrado; J. Zhu
Adjunct Faculty: D. F. Berry; F. A. Etzkorn; C. Finkielstein; B. Mukhopadhyay; F. D. Schubot; D. T. Zallen
Career Advisor: P. J. Kennelly (231-6315), pjkennel@vt.edu
Undergraduate Coordinatorc: T. O. Sitz (231-6315), tositz@vt.edu and D. R. Bevan (231-6315), drbevan@vt.edu

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Overview

The bachelor of science in biochemistry is designed to provide students with a thorough foundation in chemistry and biology and an appreciation of how these sciences are integrated to explore the molecular mechanisms underlying biological processes. The plan of study prepares students for careers in medicine, veterinary medicine, biomedical research, agriculture, industrial biochemistry, or biotechnology. In addition, it provides the background for post-graduate studies in the life sciences or professional studies in medicine, nursing, veterinary medicine, dentistry, pharmacy, and clinical chemistry.

The department offers the undergraduate biochemistry degree in two colleges, the College of Agriculture and Life Sciences and the College of Science. Biochemistry majors complete the Curriculum for Liberal Education requirements unique to the college in which they are enrolled.

The departmental requirements for majors in either college are: mathematics (9-12 credits); physics (8 credits); principles of biology (8 credits); genetics (3 credits); general microbiology (4 credits); general chemistry (8 credits); organic chemistry (8 credits); physical chemistry (6 credits); analytical chemistry (4 credits); introduction to biochemistry (1 credit); organic biochemistry (1 credit); general biochemistry (7 credits); and laboratory problems in biochemistry and molecular biology (6 credits).

To qualify for a major in biochemistry, the department requires that students maintain a minimum 2.0 grade point average (GPA) for the hours passed in all required biochemistry, biology, and chemistry courses. In addition, the department requires that a student earn a C- or better in all required biochemistry, chemistry, and biology courses.

The plan of study allows time for qualified students to participate in undergraduate research (BCHM 4994). Qualified students are strongly encouraged to initiate research activity prior to their senior year. A minimum GPA of 2.5 is required for enrollment in BCHM 4994. Students participating in undergraduate research are encouraged to present a senior thesis.

Upper-division students who qualify for the Honors Program may participate in the "in honors" degree program in biochemistry. The Honors Program and undergraduate research program include study and research with individual faculty members.

Biochemistry majors may participate in the Cooperative Education Program that alternates academic study with employment experience. Additional information pertaining to the CO-OP program is included in the "General Information" section of this catalog. Summer internships with various businesses and governmental agencies are frequently available, particularly to rising seniors.

Biotechnology Option

Biotechnology is the application of fundamental biochemical and molecular biological approaches to problems in agriculture, medicine, biotechnology, energy, and environmental sciences. The faculty in biochemistry and in several other science departments have developed an interdisciplinary option for undergraduates. To complete the option, Biochemistry majors must also take BCHM 4784 (Biotechnology Applications) and will graduate with a degree in biochemistry with an option in biotechnology. The option will introduce information, concepts, and techniques that are shaping the future of science and our society.

Bioinformatics/Genomics

The department supports students' interest in bioinformatics/genomics by providing instruction and laboratory experience in those areas. Students are advised of appropriate supporting courses in computer science that may be used toward a minor in Computer Science.

The department also offers graduate programs leading to the M.S. and Ph.D.

The minimum number of credits required for the B.S. in Biochemistry is 120.

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Suggested Schedule for Biochemistry Majors

First Year	
First Semester	**(16)**
BCHM 1014: Introduction to Biochemistry[1]	1
CHEM 1055: General Chemistry for Majors[1,5]	4
CHEM 1065: General Chemistry Lab for Majors[1,5]	1
ENGL 1105: Freshman English	3
BIOL 1105: Principles of Biology[1]	3
BIOL 1115: Principles of Biology Lab[1]	1
MATH 1016: Elementary Calculus[2]	3
Second Semester	**(15)**
CHEM 1056: General Chemistry for Majors[1,5]	4
CHEM 1066: General Chemistry Lab for Majors[1,5]	1
ENGL 1106: Freshman English	3
BIOL 1106: Principles of Biology[1]	3
BIOL 1116: Principles of Biology Lab[1]	1
MATH 2015: Elementary Calculus[2]	3
Second Year	
First Semester	**(15)**
CHEM 2565: Principles of Organic Chemistry[1,5]	3
CHEM 2545: Organic Chemistry Lab[1]	1
PHYS 2205: General Physics[1]	3
PHYS 2215: General Physics Lab[1]	1
STAT 3615: Biological Statistics[2]	3
BIOL 2604: General Microbiology[1]	3
BIOL 2614: General Microbiology Lab[1]	1
Second Semester	**(15)**
BCHM 2144: Organic Biochemistry[1]	1
CHEM 2566: Principles of Organic Chemistry[1,5]	3
CHEM 2546: Organic Chemistry Lab[1]	1
PHYS 2206: General Physics[1]	3
PHYS 2216: General Physics Lab[1]	1

Electives[3]	6
Third Year	
First Semester	**(15)**
BIOL 2004: Introductory Genetics[1]	3
BCHM 4115: General Biochemistry[1]	4
CHEM 2114: Analytical Chemistry[1] and	3
CHEM 2124: Analytical Chemistry Lab[1]	1
Electives[3]	4
Second Semester	**(16)**
BCHM 4116: General Biochemistry[1]	3
BCHM 4124: Laboratory Problems in Biochemistry and Molecular Biology[1, 4]	6
Electives[3]	7
Fourth Year	
First Semester	**(15)**
CHEM 4615: Phys. Chem. for the Life Sciences[1]	3
Electives[3]	12
Second Semester	**(15)**
CHEM 4616: Phys. Chem. for the Life Sciences[1]	3
Electives[3]	12

[1] Required course in department major.
[2] The departmental mathematics requirement may be satisfied by taking Math 1015-1016 and 2015 (Elementary Calculus with Trigonometry I & II) and one of the following: Math 2016, or Stat 3615 (Biological Statistics); or Math 1205-1206 (Calculus) and either Math 2016 or Stat 3615.
[3] Electives must include college and Curriculum for Liberal Education requirements.
[4] Enrollment requires "C-" or better in BCHM 4115.
[5] Will also accept: CHEM 1035-1036, CHEM 1045-1046, and CHEM 2535-2536.

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Progress Toward Degree

The following required courses should be completed by the end of the spring semester of the junior year for satisfactory progress toward a bachelor's degree for biochemistry majors in both the College of Agriculture and Life Sciences and in the College of Science.

BIOL 1105, 1106: Principles of Biology; BIOL 1115, 1116: Principles of Biology Lab; BIOL 2604: General Microbiology; BIOL 2614: General Microbiology Lab; BIOL 2004: Introductory Genetics; CHEM 1035, 1036: General Chemistry or CHEM 1055, 1056: General Chemistry for Majors; CHEM 1045, 1046: General Chemistry Lab or CHEM 1065-1066: General Chemistry Lab for Majors; CHEM 2535, 2536: Organic Chemistry or CHEM 2565, 2566: Principles of Organic Chemistry; CHEM 2545, 2546: Organic Chemistry Lab; PHYS 2205, 2206: General Physics; PHYS 2215, 2216: General Physics Lab.

Requirements for Minor in Biochemistry

CHEM 2114, 2124: Analytical Chemistry	4
CHEM 2535-2536: Organic Chemistry or CHEM 2565-2566 Principles of Organic Chemistry	3, 3
CHEM 2545-2546: Organic Chemistry Laboratory	1, 1
BCHM 4115-4116: General Biochemistry	4, 3
BCHM 4124: Laboratory Problems in Biochemistry and Molecular Biology	6
or BCHM 3124: Biochemical Techniques for Biotechnology and the Life Sciences	3

To qualify for a minor in biochemistry, the department requires that the student maintain a minimum 2.0 Grade Point Average (GPA) for the hours passed in all required biochemistry and chemistry courses. Furthermore, the department requires that a student earn a C- or better in

the following courses: BCHM 4115-4116 (General Biochemistry), BCHM 4124 (Laboratory Problems in Biochemistry and Molecular Biology) or BCHM 3124 (Biochemical Techniques for Biotechnology and the Life Sciences), and Chem 2535-2536 (Organic Chemistry) or CHEM 2565-2566 (Principles of Organic Chemistry).

Undergraduate Course Descriptions (BCHM)

1014: INTRODUCTION TO BIOCHEMISTRY
History and evolution of biochemistry; applications of biochemistry in agricultural and life science disciplines; topical research areas in biochemistry; educational requirements and career opportunities for biochemistry majors. I Pass/Fail only. (1H,1C)

2024: CONCEPTS OF BIOCHEMISTRY
Short course in fundamentals of the chemistry of living systems. Introduction to major categories of biochemical substances, metabolic pathways, and principles of biochemical information transfer. (No credit for majors). Pre: CHEM 2514 or CHEM 2535. (3H,3C) II.

2144: ORGANIC BIOCHEMISTRY
Organic chemistry of the fundamental structures and reactions encountered in biological chemistry. Chemical description of carbohydrates, amino acids, lipids, proteins and nucleic acids. Discussion of organic chemical reactions that describe the majority of reactions encountered in biological chemistry. Pre: CHEM 2535 or CHEM 2565. Co: CHEM 2566, CHEM 2536. (1H,1C) II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114: BIOCHEMISTRY FOR BIOTECHNOLOGY AND THE LIFE SCIENCES
Survey presentation of the basic principles of biochemistry as they apply to biotechnology. Topics covered include protein structure, enzymology, cellular organization, and biochemical regulation. Special emphasis will be given to gene structure, transcription, and translation, cellular organization, and cloning, sequencing, modification and expression of recombinant DNA. Examples will be given of agricultural/medical/industrial applications of cellular and molecular biochemical knowledge. Non-majors only. I Pre: CHEM 2536. (3H,3C)

3124: BIOCHEMICAL TECHNIQUES FOR BIOTECHNOLOGY AND THE LIFE SCIENCES
Survey of basic biochemical laboratory techniques for students interested in biotechnology, genetic engineering, and the modern life sciences. Topics include the use of buffers, spectroscopy, enzyme assays, chromatography, electrophoresis, and immunoassays in the analysis of biological macromolecules. (Non-majors only). I Co: 3114. (2H,3L,3C)

4034 (BMVS 4034): ENVIRONMENTAL HEALTH TOXICOLOGY
Health effects associated with the exposure to chemicals, identifying and managing problems of chemical exposure in work places and the environment, fundamental principles of biopharmaceutics and toxicokinetics, and risk assessment. Emphasis on conceptual understanding of chemical entry into the body, biotransformation, multiple chemical sensitivity, and chemically induced diseases. Identification of nutrient interactions with environmentally induced disorders and to understand the mechanisms of such interactions and their influence on human health and welfare. Pre: BIOL 2104 or BIOL 3124, ALS 2304, BIOL 2406 or BCHM 3114 or BCHM 4115, BCHM 4116. (3H,3C)

4054 (APSC 4054): GENOMICS
A contemporary analysis of the development, utility and application of high-resolution methods for the study and manipulation of the complete genomes of organisms. The use of new techniques for genomic, metabolic and protein engineering (functional genomics), including high-throughput methods and nanotechnology, will be emphasized. Pre: 3114 or 4116 or BIOL 3774. (3H,3C) II.

4074: CAREER ORIENTATION
Examination of various career opportunities for biochemists in industry, academia, medicine and related health sciences. Introduction to resources for locating career opportunities, resume preparation and interview skills. Restricted to biochemistry majors and minors. Junior standing required. I Pass/Fail only. Co: 4115. (1H,1C)

4115-4116: GENERAL BIOCHEMISTRY
Metabolism and chemistry of carbohydrates, proteins, lipids, and nucleic acids with emphasis on interactions and comparative aspects of microbial, plant, and animal forms. For students in the biochemistry curriculum and other students interested in a foundation course. (Students are required to have at least a C- in both Chem 2535 and 2536 to be admitted to BCHM 4115). Pre: CHEM 2536 for 4115; 4115 for 4116. 4115: (4H,4C) 4116: (3H,3C) I,II.

4124: LABORATORY PROBLEMS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY
Presentation of major analytical techniques of importance to biochemistry and molecular biology, including spectrophotometry, electrophoresis, chromatography, and use of radioisotopes. Lab study of selected principles and methods used in biochemistry and molecular biology. Pre: 4115, (CHEM 2114, CHEM 2124) or (CHEM 3114, CHEM 3124). Co: 4116. (3H,9L,6C) I,II.

4754: INTERNSHIP
Variable credit course.

4784 (BIOL 4784): BIOTECHNOLOGY APPLICATIONS
Covers medical, agricultural, environmental and industrial biotechnology and their ethical, legal and social implications. Includes the commercial exploitation of microbes, plants, and animals, plus safety of the food supply, conservation genetics, use in forensic science, patent laws, and the

regulations governing biotechnology in the U.S. and overseas. Does not count as Biology elective for biology majors/minors. Pre: (3114, 3124, BIOL 3774, BIOL 4774) or (BCHM 4116, BCHM 4124). (3H,3C) II.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Agriculture and Life Sciences Programs of Study
Agricultural and Applied Economics | Agricultural and Extension Education | Agriculture and Life Sciences
Agriculture Technology | Animal and Poultry Science | Biochemistry | Biological Systems Engineering
Crop and Soil Environmental Sciences | Dairy Science | Entomology | Food Science and Technology | Horticulture
Human Nutrition, Foods, and Exercise | Plant Pathology, Physiology, and Weed Science

College of Science Programs of Study
Biochemistry | Biology | Chemistry | Economics | Geosciences | Mathematics | Physics | Psychology | Statistics

College of Science

Biological Sciences

www.biol.vt.edu/

Robert H. Jones, Head
Distinguished Professors: A. L. Buikema; G. M. Simmons, Jr.; J. J. Tyson
Harold H. Bailey Endowed Chair: J. R. Walters
Professors: R. M. Andrews; E. F. Benfield; D. S. Cherry; K. D. Elgert; J. O. Falkinham; K. W. Hilu; R. Jensen; R. H. Jones; L. Li; E. T. Nilsen; B. D. Opell; D. L. Popham; J. Phillips; H. M. Valett; J. R. Webster; B. S. Winkel
Associate Professors: C. B. Lawrence; I. Lazar; I. T. Moore; S. B. Melville; J. Sible; A. M. Stevens; B. J. Turner; R. A. Walker; Z. Yang
Assistant Professors: D. Banerjee; J. Barrett; L. K. Belden; D. Capelluto; D. Cimini; C. Finkielstein; D. Hawley; J. Kuhn; B. Scharf; F. Schubot; D. Tholl; J. W. Via
Instructors: J. Evans; M. V. Lipscomb; M. S. Rosenzweig; R. W. Seyler
Adjunct Professors: R. G. Benoit; D.M. Denbow; N. R. Krieg; R. Sheppard; E. Shokraii

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Overview

The biological sciences curriculum is designed to provide a broad education in the fundamentals of the discipline: ecology, evolutionary and environmental biology; systematic and structural biology; and molecular cell biology. It also allows a selection of courses to prepare students for the health professions and for graduate training in ecology, environmental biology, genetics, microbiology, botany, zoology, molecular biology, and related fields. In addition, through interdisciplinary programs, students are provided the core background for employment opportunities in biotechnology, food science, bioinformatics, bio-business, and health-related industries.

Preparation for Advanced Study

Graduate Study

Students who satisfactorily complete the undergraduate curriculum in biological sciences or related fields may pursue advanced studies leading to the M.S. or Ph.D. in various branches of the biological sciences.

Preparation for Medicine

The training afforded by the first three years (approximately 96 hours) meets the pre-medical training requirements of medical colleges that accept students with only three years of undergraduate work. It is strongly recommended, however, that all students complete the B.S. before entering medical school.

Preparation for Dentistry

Dental colleges require a minimum of three years of college training for admission, but it is generally advisable for students to complete the B. S. before entering dental school.

Preparation for Allied Health Professions

Schools of Allied Health Professions, such as nursing, pharmacy, medical technology, physical therapy, etc., require two or more years of

college work for admission. Specific requirements are available from Career Services or the Biological Sciences Department.

Preparation for Veterinary Medicine

Veterinary schools require a minimum of three years of college training for admission. Few students who meet only the minimum entrance requirements are accepted by veterinary schools.

Major Requirements

The requirements for the biological sciences major include, in addition to the university Curriculum for LIberal Education and college core curricula: Principles of Biology (6 hours); Biological Principles lab (2 hours); Genetics (3 hours); Cell and Molecular Biology (3 hours); Ecology (3 hours); Evolutionary Biology (3 hours); and General Microbiology and Lab (4 hours) or Plant Biology (3 hours) or General Zoology (3 hours); and biological science electives (19 hours including two 3000/4000-level lab courses). Cognate sciences required are: General Chemistry (8 hours); Organic Chemistry (8 hours); and General Physics (8 hours). Math requirements are: 6 hours of mathematical sciences including successful completion of Math 2015 plus 3 hours of Statistics (Stat 3615).

Minor Requirements

Requirements for the minor in biology include General Biology or Principles of Biology (8 hours); Biological Principles lab (2 hours); Genetics (3 hours) or Cell and Molecular Biology (3 hours); Ecology (3 hours) or Evolutionary Biology (3 hours); and two 3000/4000-level biology electives (one with 3000/4000-level lab) for a minimum of 21 hours.

Options

Option in Biotechnology

The option in Biotechnology is an interdisciplinary and interdepartmental program that draws upon the expertise of several departments in the colleges of Agriculture and Life Sciences, Science, and Engineering. Majors from participating departments in the three colleges may add this option to the B.S. degree. A series of core courses must be followed to complete the option. Specific academic plans should be developed by each student in cooperation with the departmental biotechnology advisor.

Option in Microbiology/Immunology

Students interested in the microbiology/immunology option must meet the usual requirements for the B.S. in Biological Sciences. In addition, option students must take 12 of the 19 hours of required Biological Sciences elective credits in microbiology and biochemistry.

Satisfactory Progress

University policy requires that students make satisfactory progress toward a degree by meeting minimum criteria toward the Curriculum for Liberal Education (see "Academics" chapter), toward the College of Science Core (see first part of this chapter), and required courses in Biological Sciences.

Satisfactory progress toward the B.S. in Biological Sciences requires that a student:

1) Earn a C (2.0) grade or better in each of BIOL 1105, 1106, 1125, and 1126 or the equivalent.
2) Achieve an overall GPA of 2.0 and an in-major GPA of 2.2 upon having attempted 45 hours (including transfer, advanced placement and pass/fail).
3) Upon having attempted 72 semester credits, students must have completed the following courses:

Biol 1105, 1106: Principles of Biology	6
Biol 1125, 1126: Biological Principles Lab	2
Three of the following:	
Biol 2004: Genetics	3
Biol 2104: Cell and Molecular Biology	3
Biol 2704: Evolutionary Biology	3
Biol 2804: Ecology	3
Biology electives	3
CHEM 1035, 1036: General Chemistry	6

CHEM 1045, 1046: General Chemistry Lab	2
CHEM 2535: Organic Chemistry	3
CHEM 2545: Organic Chemistry Lab	1
MATH 1016, 2015: Elementary Calc. w/ Trig.	6
Credits	**(41)**

Undergraduate Courses (BIOL)

1004: BIOLOGY ORIENTATION SEMINAR
An introduction to academic and career planning for majors in Biology and students who may be considering Biology as a major. (1H,1C)

1005,1006: GENERAL BIOLOGY
Primarily for those not majoring in the life sciences. General principles of biology and their relevance to society. 1005: Cell function and physiology, nutrition, circulation and water balance in plants and animals, hormones, nerves. 1006: Muscles, behavior, genetics, development, populations, evolution, ecology and the life kingdoms. (Duplicates 1105, 1106). (3H,3C) I,II.

1015,1016: GENERAL BIOLOGY LAB
Primarily for students not majoring in the life sciences. Laboratory experiments emphasizing observation and experimental procedures to investigate biological processes and phenomena. 1015: Cell biology and genetics. 1016: Plant, animal and environmental biology. (Duplicates 1115, 1116; 1125, 1126). (2L,1C) I,II.

1044: LIFE SCIENCES IN THE 21ST CENTURY
Emphasizes development of an awareness and appreciation of biology as part of human history and how the biological sciences will provide for future environmental, technological, cultural, social and government needs. This information should assist students in selecting an area of career-oriented study in the Life Sciences. (1H,1C)

1105,1106: PRINCIPLES OF BIOLOGY
For students majoring in the life sciences. 1105: biological molecules, cell structure, metabolism, and reproduction; Mendelian and molecular genetics. 1106: animal and plant anatomy and physiology, ecology, and animal behavior. (Duplicates 1005, 1006). Co: 1116, 1115 for 1105. (3H,3C) I,II.

1115,1116: PRINCIPLES OF BIOLOGY LABORATORY
Emphasizes biological principles through investigative exercises and collaborative learning. 1115: cell chemistry, physiology and reproduction and genetics; 1116: plant and animal form and function, and ecology. Primarily for students majoring in the life sciences. (Duplicates 1015 1016, 1125, 1126) . I,II. X-grade allowed. Co: 1105 for 1115; 1106 for 1116. (3L,1C)

1125,1126: BIOLOGICAL PRINCIPLES LAB
Emphasizes biological principles through experimental design and collaborative learning. 1125: cell chemistry, physiology and reproduction, genetics and evolution. 1126: plant and animal form and function, and ecology. This writing intensive course is part of the Writing Across the Major option; these two laboratory courses plus three additional designated Biology courses will fulfill the Area I Writing Intensive requirement for Biology majors. Primarily for students majoring in Biology. (Duplicates 1015, 1016, 1115, 1116). Co: 1106, 1105 for 1125; 1105, 1106 for 1126. (3L,1C) I,II.

1205H,1206H: HONORS BIOLOGY
Emphasizes biological principles through investigative exercises and collaborative learning. 1205H: cell chemistry and structure, energy transformations, genetics and microevolution. 1206H: macroevolution, plant and animal physiology, populations, ecology and behavior. This is a writing intensive course. Simultaneous enrollment in laboratory required. For students who qualify for the University Honors Program. (Duplicates 1005, 1006; 1105,1106). (3H,3L,4C) I,II.

2004: GENETICS
Mendelian transmission, chromosome behavior and organization, gene and chromosome mutation, genetic properties of nucleic acids, gene expression and development, DNA technology. X-grade allowed. Pre: (1005 or 1105 or 1205H), (1006 or 1106 or 1206H), (CHEM 1036 or CHEM 1056 or CHEM 1036H or CHEM 1056H or CHEM 1016). (3H,3C) I,II.

2104: CELL AND MOLECULAR BIOLOGY
Fundamental molecular mechanisms essential for the function of prokaryotic and eukaryotic cells. Topics will include: organization and maintenance of cellular structure, energy production, transcriptional regulation, protein synthesis, regulatory pathways, cell-cell interactions and reproduction. Pre: (1005 or 1105 or 1205H), (1106 or 1206H or 1006), (CHEM 1036 or CHEM 1056 or CHEM 1016 or CHEM 1036H or CHEM 1056H). (3H,3C) I,II.

2204: PLANTS AND CIVILIZATION
The uses of plants as sources of food, medicine, drugs, spices, beverages, poisons, fiber, oils, and plant exudates. I Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H). (3H,3C)

2304 (HORT 2304): PLANT BIOLOGY
Introductory botany. Form, growth, function, reproduction, and ecological adaptations of major groups of plants. Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H). (3H,3C) I,II.

2404 (ALS 2404): BIOTECHNOLOGY IN A GLOBAL SOCIETY
Introduction to the world-wide impact of biotechnology and molecular biology, including applications to plants, animals, and microorganisms.

Explores basic concepts of genetic engineering, scientific and ethical issues, and public concerns related to biotechnology. Topics include: environmental release of genetically engineering organisms, bioremediation, safety of genetically engineered food products, transgenic plants and animals, gene therapy, and genetic screening. Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H), CHEM 1015, CHEM 1016. (3H,3C) II.

2504: GENERAL ZOOLOGY
Morphology, features, adaptations, and ecology of major animal groups, emphasizing major patterns of evolutionary change. Pre: (1005 or 1105 or 1205H), (1006 or 1106 or 1206H). (3H,3C) I,II.

2604: GENERAL MICROBIOLOGY
Microbial structure, function, metabolism, genetics and ecology. The role of microorganisms in host/parasite relationships will be emphasized. Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H), (CHEM 1015, CHEM 1016) or (CHEM 1035, CHEM 1036). (3H,3C) I,II.

2604H: HONORS GENERAL MICROBIOLOGY
Microbial structure, function, metabolism, genetics and ecology. The role of microorganisms in host/parasite relationships will be emphasized. Additional written assignments, class discussions, and readings from the primary literature will be required. Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H), (CHEM 1015, CHEM 1016) or (CHEM 1035, CHEM 1036). (3H,3C)

2614: GENERAL MICROBIOLOGY LABORATORY
Introduction to microbiological techniques and procedures. BIOL 2604 may be taken as a Corequisite with 2614. Pre: 2604. (3L,1C) I,II.

2704: EVOLUTIONARY BIOLOGY
Evolutionary mechanisms, systematic principles, and theories of the origin and evolution of life. Pre: (1005 or 1105 or 1205H), (1006 or 1106 or 1206H). (3H,3C) I,II.

2804: ECOLOGY
Fundamental interaction of organisms with the biotic and abiotic components of ecosystems. Topics will include: physical environment and organismic interactions, concepts of population ecology and community ecology, ecosystems interactions, and environmental problems. Pre: (1005 or 1105 or 1205H), (1006 or 1106 or 1206H). (3H,3C) I,II.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3014 (ENT 3014): INSECT BIOLOGY
Insect biology provides an introduction to the science of entomology. The course covers the diversity of insects, their biology and behavior, the importance of insects and insect control programs in agriculture, and the effects that insects have had on human history and culture. Laboratory (3024) is optional. I Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H). (2H,2C)

3024 (ENT 3024): INSECT BIOLOGY LABORATORY
Taxonomy and ecology of insects commonly encountered. Identification of all orders and many common families. Ecological attributes of each taxon, including food, habitat, life cycle, and behavior. An insect collection is required. I Pre: (1005, 1006) or (1105, 1106) or (1205H, 1206H). Co: 3014. (3L,1C)

3114: FIELD AND LABORATORY ECOLOGY
Experimental and field studies of population growth, competition, stressed ecosystems, plant distribution, and other interactions of plants, animals and microbes with their environments. Several required weekend field trips. Pre: 2804. (3L,1C) II.

3124: CELL PHYSIOLOGY
Cell structure and metabolism, including enzymes, energy production, photosynthesis, membranes, nerve conduction, muscle contraction, and regulation of cellular activity. Pre: 2104, CHEM 2536. (3H,3C) I,II.

3204: PLANT TAXONOMY
Systematic survey of vascular plants, emphasizing identification, terminology, classification, evolutionary relationships. X-grade allowed. Pre: 2304. (2H,3L,3C) II.

3254 (ENT 3254): MEDICAL AND VETERINARY ENTOMOLOGY
An introduction to the roles of insects and other arthropods in the direct causation of disease in humans and animals, and as vectors in the transmission of disease organisms. The epidemiology and replication cycles of vector-borne pathogens with major medical and veterinary importance will be examined. Information will be provided on the biology and behavior of disease vectors and external parasites, and on the annoying and venomous pests of humans and animals. Mechanisms of control will be discussed Pre: (1005, 1006) or (1105, 1105) or (1205H, 1206H). (3H,3C) II.

3264 (ENT 3264): MEDICAL AND VETERINARY ENTOMOLOGY LABORATORY
Taxonomy and anatomy of insects and arthropods of medical and veterinary importance. Examination of feeding behavior and ecology. Emphasis on the mechanism of injury or pathogen transmission by each group. II. Pre: (1105, 1106) or (1005, 1006) or (1205H, 1206H). Co: 3254. (3L,1C)

3404: INTRODUCTORY ANIMAL PHYSIOLOGY
A comparative systems level approach to the physiology of animals, emphasizing vertebrates: metabolic, temperature, osmotic, and ionic regulation; function of respiratory, circulatory, digestive, muscle, nervous, and locomotory systems; endocrine regulation and biological rhythms. Must have prerequisites or instructor's permission. Pre: (1005, 1006) or (1105, 1106). (3H,3C) II.

3444 (PPWS 3444): EXPLAINING MOLECULAR CELL BIOLOGY (WRITING INTENSIVE)
This writing-intensive course will enable students to improve both their own scientific writing and their understanding of the writing of specialists, scientists in other fields and lay readers. Topics include bacterial, plant, biomedical examples of major advances in molecular cell biology and biotechnology. Includes a review of current methodologies, in-class writing workshops and problem-solving sessions, mock press conferences, individual and team presentations, and individual conferences with the instructor. Pre: 2104. (3H,3C) II.

3454: INTRODUCTORY PARASITOLOGY
Ecology, taxonomy, morphology, life cycles, pathogenesis, and host-parasite relationships of parasitic eukaryotes. I Pre: 2504. (3H,3L,4C)

3504H: HOSPITAL PRECEPTORSHIP
Cooperative course with Montgomery County Hospital. Students work and study in the various divisions of the hospital under supervision of physicians and other health professionals. Selection by Biology and University Premedical committees and approval by the hospital required. I (6L,2C)

3774: MOLECULAR BIOLOGY
Advanced study of the molecular biology of prokaryotic and eukaryotic cells, including mechanisms of gene expression and regulation, relative merits of experimental model systems, and practical applications in agriculture and medicine. Pre: 2104 or ALS 3104. (3H,3C) II.

3954: STUDY ABROAD
Variable credit course.

4004: FRESHWATER ECOLOGY
Interactions of physical, chemical, and biological properties of freshwater ecosystems. Senior standing required. Pre: 2804. (3H,3L,4C) I,II.

4014: ENVIRONMENTAL TOXICOLOGY
Discussion of ecotoxicological and philosophical issues in the development of standards for control of toxic chemicals in freshwater, including site-specific examples, application of current control methods, recovery of damaged ecosystems, and government regulations. Pre: 2804. (2H,2C)

4044 (GEOG 4044): BIOGEOGRAPHY
A survey of the field of biogeography. A study of the
factors influencing the distribution of plants and animals approached from ecological, historical, and cultural perspectives. Human influence on biotic patterns, such as crop domestication, habitat alteration, species introductions and extinctions, management issues, and environmental change, is a primary force. Pre: 2804 or GEOG 1104. (3H,3C)

4075-4076: BIOINFORMATICS METHODS
Application of bioinformatics methods in biological research. Begins with theory and methods for analysis of proteins and protein families, and progresses to analysis of complex data sets including whole genome sequences and gene expression. Laboratory begins with basic techniques for information gathering and molecular sequence and structure analysis, and progresses to analysis of genome sequences and gene expression data sets. The laboratory component will provide experience in use of standard bioinformatics software and databases.
Pre: 3774, BCHM 3114. (2H,3L,3C)

4104: DEVELOPMENTAL BIOLOGY
Morphological, physiological, and molecular events in embryological and developmental systems, including regulation at the level of transcription, translation, and enzyme or hormone activation. Pre: 2004. (3H,3C)

4134: EVOLUTIONARY GENETICS
Genetic variation, Hardy-Weinberg equilibrium, agents of change in gene frequencies, molecular evolution, mechanisms of speciation. Comparison of theoretical models with natural and laboratory populations. Pre: 2004. (3H,3C) II.

4164 (CEE 4164) (CSES 4164) (ENSC 4164): ENVIRONMENTAL MICROBIOLOGY
Ecology, physiology, and diversity of soil and aquatic microorganisms; incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Pre: 2604. (2H,3L,3C) II.

4204: DEVELOPMENTAL PLANT ANATOMY (WRITING INTENSIVE)
Microscopic structure of cells, tissues, and tissue systems of vascular plants in relation to growth, development, and physiology. Writing intensive. Even years. I Pre: 2304. (2H,6L,4C)

4244: MYCOLOGY (WRITING INTENSIVE)
Morphology, ecology, classification and field and laboratory study of fungi: form and function, uses by man, plant and animal pathogens, and role in ecosystems. Writing intensive. I Pre: 2304. (2H,6L,4C)

4314: PLANT ECOLOGY (WRITING INTENSIVE)
Introduction to ecology of terrestrial plants including major plant functional types, behavior of populations, responses of plant communities to disturbance, vegetation classification, and ordination. Laboratory covers methods for measuring and analyzing natural vegetation, and setting up field and greenhouse experiments. This is a writing intensive course. Even years. Pre: (2304 or 2804 or FOR 3314). (3H,3L,4C) II.

4324 (GEOS 4324): PLANT EVOLUTION (WRITING INTENSIVE)
Geological history, comparative morphology, evolution and systematics of pre-vascular and vascular plants. Focus on evolution of communities, adaptive construction of tissues and organs, and ecology of reproduction. Pre: 2304. (2H,6L,4C)

4354 (ENT 4354): AQUATIC ENTOMOLOGY
Biology and taxonomy of insects and other macroinvertebrates most commonly encountered in freshwater environments. Selected aspects of biology, such as habitat, feeding, locomotion, and life history. Identification of individual taxa, mostly at family and genus level. Significance of these organisms in aquatic ecology, pollution monitoring, and natural resource management. Pre: (1005, 1006), (1015, 1016) or (1105, 1106, 1115, 1116). (3H,3L,4C)

4404: ORNITHOLOGY
Biology of birds, including functional anatomy, systematics, evolutionary history, behavior, and ecology. Laboratory on systematics, anatomy, and field experience in the areas of behavior and ecology. Pre: 2804. (3H,3L,4C) II.

4434: MAMMALOGY
Biology of mammals including evolution, systematics, anatomy, physiology, and ecology. Laboratory on systematics, morphology, zoogeography, and diversity of North American mammals. I Pre: 2804. (3H,3L,4C)

4454: INVERTEBRATE ZOOLOGY
Identification, morphology, evolutionary relationships, and natural history of free-living invertebrates, excluding insects. I Pre: 2504. (3H,3L,4C)

4474: ETHOLOGY
An evolutionary and ecological approach to animal behavior, drawing on behavioral genetics, endocrinology, neurophysiology, and behavioral ecology to explain how and why the behavior of an organism is adapted to its environment. I Pre: 2504. (3H,3C)

4484 (ENT 4484) (FIW 4484): FRESHWATER BIOMONITORING
Concepts and practices of using macroinvertebrates and fish to monitor the environmental health of freshwater ecosystems. Effects of different types of pollution and environmental stress on assemblages of organisms and underlying ecological principles. Role of biological studies in environmental regulation. Study design, field and laboratory methods, data analysis and interpretation, verbal and written presentation of results. Pre: (2804), (4004 or 4354 or ENT 4354 or FIW 4424 or FIW 4614). (3H,3L,4C)

4524: ENVIRONMENTAL ANIMAL PHYSIOLOGY
Physiological adaptations to environmental factors, emphasizing vertebrate organ systems. Evolutionary and acclimatory processes will be considered. Must have prerequisites or instructor's permission. Writing intensive. Odd years. II. Pre: 3404. (3H,3C)

4534: COMPARATIVE ENDOCRINOLOGY (WRITING INTENSIVE)
Physiology of endocrine systems, emphasizing vertebrates but including invertebrates. Mechanisms of hormone action, physiologic roles of hormones, and overall integration. Must have prerequisites or instructor's permission. I Pre: 3404. (3H,3C)

4554 (ALS 4554): NEUROCHEMICAL REGULATION
Neurochemical transmission within the vertebrate brain will be examined. Emphasis will be placed on the chemical coding underlying the control of various behaviors and how these systems can be modified by various drugs or diet. Pre: (ALS 2304 or BIOL 3404), (CHEM 2535). (3H,3C) II.

4574 (ALS 4574): SOCIAL BEHAVIOR OF BIRDS AND MAMMALS
This course examines origins, influences and implications of social behavior in a variety of avian and mammalian species. Emphasis is placed on understanding group organization and dynamics in inter and intra-species situations. Experimental data from several disciplines (e.g., genetics, physiology, biochemistry) are reviewed to demonstrate their associations with behavioral
adaptive mechanisms. Avian and mammalian species living in wild, zoo, agricultural companion and laboratory settings are discussed. Pre: 1106, ALS 3104 or BIOL 2004. (3H,3C)

4604 (FST 4604): FOOD MICROBIOLOGY
Role of microorganisms in foodborne illness and food quality, spoilage, and preservation. Control and destruction of microorganisms in foods. Pre: 2614, 2604. (3H,3L,4C) II.

4624: MICROBIAL GENETICS
Molecular genetics of bacteria and their associated plasmids and phages. I Pre: 2004, 2604. (3H,3C)

4634: MICROBIAL PHYSIOLOGY
The study of the structure, function and metabolic activities of prokaryotic microorganisms. Topics covered included cell composition and growth, metabolic unity and diversity, patterns of regulation, transport mechanisms, environmental sensing and response and cellular differentiation processes. (BIOL 4624 is recommended, but not required.) Pre: 2604, (2004 or 2104). (3H,3C)

4644: MICROBIAL MOLECULAR GENETICS AND PHYSIOLOGY LABORATORY
Introduction to classical and molecular methods used for the study of bacterial genetics and physiology. Laboratory exercises cover analysis of patterns of gene regulation; assay of enzymatic activities; mutagenesis followed by selection, screening, and physiological characterization of mutant strains; genome database utilization; and large scale fermentation. Pre: 4624. (1H,6L,3C)

4664: VIROLOGY
Classification, structure, pathogenesis, host response, and replication strategies of viruses of bacteria, plants, and animals, stressing mechanisms elucidated by molecular biological techniques. I Pre: 2104, 2604, 2614. (3H,3C)

4674: PATHOGENIC BACTERIOLOGY
Characteristics of bacteria that cause human disease, nature of infectious processes, virulence factors, epidemiology, resistance, immunization. Pre: 2004, 2104, 2604, 2614. (3H,3C)

4704: IMMUNOLOGY
Immunochemistry of antigens and antibodies, serological reactions, chemistry of complement, control of immunity, immune response of an intact animal. Pre: CHEM 2536 or BIOL 2104. (3H,3C)

4714: IMMUNOLOGY LABORATORY
Serological and immunobiological techniques used to interpret the consequences of an immune response. Pre: 4704. (3L,1C) I,II.

4724: PATHOGENIC BACTERIOLOGY LAB
Microbiological techniques used in the laboratory to identify and characterize bacteria that cause infectious diseases. Pre: 2004, 2104, 2604, 2614. Co: 4674. (3L,1C)

4764: CAPSTONE MICROBIOLOGY AND IMMUNOLOGY SEMINAR
Student presentation of topics in microbiology and immunology in dialogue with interdepartmental microbiology and immunology faculty. Junior-senior standing and candidate for graduation in the department's microbiology and immunology option. Pass/Fail only. (1L,1C) I,II.

4774: MOLECULAR BIOLOGY LAB
An introduction to recombinant DNA methods, including restriction endonuclease digestion, gel electrophoresis, cloning, Southern blotting, polymerase chain reaction, sequencing and analysis of reporter gene expression in transgenic organisms. BIOL 3774 may be taken as a corequisite with 4774. I,II. Pre: 3774. (1H,6L,3C)

4784 (BCHM 4784): BIOTECHNOLOGY APPLICATIONS
Covers medical, agricultural, environmental and industrial biotechnology and their ethical, legal and social implications. Includes the commercial exploitation of microbes, plants, and animals, plus safety of the food supply, conservation genetics, use in forensic science, patent laws, and the regulations governing biotechnology in the U.S. and overseas. Does not count as Biology elective for biology majors/minors. Pre: BCHM 3114, BCHM 3124, (BIOL 3774, BIOL 4774) or (BCHM 4116, BCHM 4124). (3H,3C) II.

4804: PROKARYOTIC DIVERSITY
The study of the vast array of physiological, morphological, and behavioral properties of prokaryotes. Topics include: modern prokaryotic classification, prokaryotic diversity, relationship and importance to cell and molecular biology and biochemistry, application and use in industry and agriculture, and to the maintenance of the biosphere. Must have pre-requisites or consent of the instructor. Pre: 2604, 2614, (3124 or BCHM 3114). (3H,3C)

4884: CELL BIOLOGY
Advanced study of the inner workings of eukaryotic cells, including membrane structure and function, protein secretion, the cytoskeleton, cell cycle control and intercellular communication. Pre: 3774 or BCHM 4116. (3H,3C) II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course. X-grade allowed.

TOP

College of Science

Chemistry

www.chem.vt.edu/

J. S. Merola, Chair
B. E. Hanson, Associate Chair
University Distinguished Professor: D.G.I. Kingston
University Distinguished Professor and Ethyl Corporation Chair: J. E. McGrath
Professors: K. J. Brewer; P. Carlier; T. D. Crawford; H. C. Dorn; F. A. Etzkorn; R. D. Gandour; H. W. Gibson; B. E. Hanson; T. E. Long; H. Marand; J. S. Merola; R. B. Moore; J. R. Morris; J. S. Riffle; J. M. Tanko; S. R. Turner
Associate Professors: P. G. Amateis; P. A. Deck; A. R. Esker; G. L. Long; T. M. Reineke; B. M. Tissue; D. Troya; G. T. Yee
Assistant Professors: L. A. Madsen; W. L. Santos; E. F. Valeev; S. Wi
Instructors: M. A. Berg; M. Bump; V. K. Long; C. Santos; C. Slebodnick
Advanced Instructor: J.E. Eddleton
Career Advisor: B.E. Hanson
Director of Graduate Studies: P. A. Deck
Graduate Program Coordinator: A. Miller
Director of Undergraduate Programs: B. E. Hanson
Undergraduate Program Coordinator: A. Hawthorne
Director of General Chemistry: P. G. Amateis

Overview

The Chemistry Department offers two undergraduate programs: the B.S. in Chemistry and the B.A. in Chemistry. The B.S. curriculum provides the breadth and depth to give graduates a wide choice of career options, including further graduate studies. The Chemistry Department is approved by the American Chemical Society's Committee on Professional Training and the B.S. degree meets the guidelines for an ACS-certified degree. The B.A. program has fewer required chemistry courses, allowing students to design a chemistry program with more electives to meet a wider set of career goals. The B.A. is often chosen by students who wish to pursue a double major or to take other courses to prepare for professional school, law, or business. Either the B.S. or the B.A. degree is suitable to prepare for high school teaching. The Chemistry Department supports and encourages all chemistry majors to pursue undergraduate research sometime during their degree program.

Graduate Program

The Department offers M.S. and Ph.D. degrees with specializations in many areas of chemistry. (See the Graduate Catalog for further information.)

Bachelor of Science

First Year	
First Semester	
CHEM 1055: General Chemistry for Majors	(4)
CHEM 1065: General Chemistry for Majors Lab	(1)
ENGL 1105: Freshman English	(3)
MATH 1114: Elementary Linear Algebra	(2)
MATH 1205: Calculus	(3)

Electives[1]	(3)
Credits	**(16)**
Second Semester	
CHEM 1056: General Chemistry for Majors	(4)
CHEM 1066: General Chemistry for Majors Lab	(1)
ENGL 1106: Freshman English	(3)
MATH 1206: Calculus	(3)
MATH 1224: Vector Geometry	(2)
Electives[1]	(3)
Credits	**(16)**
Second Year	
First Semester	
CHEM 2154: Analytical Chemistry for Chemistry Majors	(4)
CHEM 2164: Analytical Chemistry Lab for Chemistry Majors	(1)
CHEM 2565: Principles of Organic Chemistry	(3)
MATH 2224: Multivariable Calculus	(3)
PHYS 2305: Foundations of Physics	(4)
Credits	**(15)**
Second Semester	
CHEM 2566: Principles of Organic Chemistry	(3)
CHEM 2555: Organic Synthesis & Techniques Lab	(2)
CHEM 4014: Survey of Chemical Literature	(1)
MATH 2214: Introduction to Differential Equations	(3)
PHYS 2306: Foundations of Physics	(4)
CHEM 2424: Descriptive Inorganic Chemistry	(3)
Credits	**(16)**
Third Year	
First Semester	
CHEM 3615: Physical Chemistry	(3)
CHEM 2556: Organic Synthesis & Techniques Lab	(2)
BCHM 3114 or 4115 (Biochemistry elective)	(3)
STAT XXXX or CS XXXX Statistics or Computer Science elective (not CS 1004)	(3)
Electives[1]	(3)
Credits	**(14)**
Second Semester	
CHEM 3616: Physical Chemistry	(3)
CHEM 3625: Physical Chemistry Lab	(1)
Electives[1]	(11)
Credits	**(15)**
Fourth Year	
First Semester	
CHEM 3626: Physical Chemistry Lab	(1)
CHEM 4114: Instrumental Analysis	(3)
CHEM 4124: Instrumental Analysis Lab	(1)
CHEM 4404: Physical Inorganic Chemistry	(3)
Electives[1]	(6)
Credits	**(14)**

Second Semester	
CHEM 4414: Inorganic Chemistry Laboratory	(2)
CHEM 4XXX CHEM/BCHM/BIOC/CHE elective, 4000-level or higher	(3)
Electives[1]	(9)
Credits	**(14)**
[1] Electives must include Curriculum for Liberal Education requirements.	

Bachelor of Arts

First Year	
First Semester	
CHEM 1055: General Chemistry for Majors	(4)
CHEM 1065: General Chemistry for Majors Lab	(1)
ENGL 1105: Freshman English	(3)
MATH 1015: Elementary Calculus with Trigonometry I	(3)
Electives[1]	(3)
Credits	**(14)**
Second Semester	
CHEM 1056: General Chemistry	(4)
CHEM 1066: General Chemistry Lab	(1)
ENGL 1106: Freshman English	(3)
MATH 1016: Elementary Calculus with Trigonometry I	(3)
Electives[1]	(4)
Credits	**(15)**
Second Year	
First Semester	
CHEM 2154: Analytical Chemistry for Majors	(4)
CHEM 2164: Analytical Chemistry Lab for Majors	(1)
CHEM 2565: Principles of Organic Chemistry	(3)
CHEM 2545: Organic Chemistry Lab	(1)
MATH 2015: Elementary Calculus with Trigonometry II	(3)
PHYS 2205: General Physics	(3)
PHYS 2215: Physics Lab	(1)
Credits	**(16)**
Second Semester	
CHEM 2566: Principles of Organic Chemistry	(3)
CHEM 2546: Organic Chemistry Lab	(1)
CHEM 4014: Survey Chemical Literature	(1)
CHEM 2424: Descriptive Inorganic Chemistry	(3)
MATH 2016: Elementary Calculus with Trigonometry II	(3)
PHYS 2206: General Physics	(3)
PHYS 2216: Physics Lab	(1)
Credits	**(15)**
Third Year	
First Semester	
CHEM 4615: Physical Chemistry for Life Sciences	(3)
CS/STAT XXXX Computer Science or Statistics elective (Not CS 1004)	(3)
Electives[1]	(9)

Credits	**(15)**
Second Semester	
CHEM 4616: Physical Chemistry for Life Sciences	(3)
CHEM 3625: Physical Chemistry Lab	(1)
Electives[1]	(11)
Credits	**(15)**
Fourth Year	
Electives[1]	(30)

[1] Electives must include 6 hours of chemistry, biochemistry, or chemical engineering at the 3000-level or higher, and College and Curriculum for Liberal Education requirements.

Minor in Chemistry

A.	
CHEM 1035 & 1045: General Chemistry + Lab	(4)
CHEM 1036 & 1046: General Chemistry + Lab, **or** CHEM 2114 & 2124: Analytical Chemistry + Lab (may be taken instead of CHEM 1036 & 1046)	(4)
B.	
2535: Organic Chemistry	(3)
2536: Organic Chemistry	(3)
2545, 2546: Organic Chemistry Lab	(1-2)
2114: Analytical Chemistry **or** 3114: Analytical Chemistry for Life Sciences*	(3)
2124: Analytical Chemistry Lab **or** 3124: Analytical Chemistry for Life Sciences Lab*	(1)
CHEM 2114 & 2124 may be substituted for CHEM 2536 and 2546 only if not used towards fulfilling requirement A.	
C. Two additional 3-credit chemistry courses at the 3000- level or higher and higher, excluding 4014 and 4024.	

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics" chapter in this catalog), toward the College of Science requirements (see first part of this chapter), and toward the degree in chemistry.

Satisfactory progress toward the degree in chemistry requires that:

1) Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit-by-examination), students must have completed:

B.S. in Chemistry

CHEM 1055, 1056: General Chemistry for Majors	8
CHEM 1065, 1066: General Chemistry for Majors Lab	2
CHEM 2565, 2566: Principles of Organic Chemistry	6
CHEM 2555, 2556: Org. Syn. & Tech Lab	4
CHEM 2154: Analytical Chemistry for Majors	3
CHEM 2164: Analytical Chemistry Lab for Majors	1
CHEM 3615: Physical Chemistry	3
MATH 1114: Elementary Linear Algebra	2

MATH 1224: Vector Geometry	2
MATH 1205, 1206: Calculus	6
MATH 2224: Multivariable Calculus	3
PHYS 2305: Foundations of Physics	4
Credits	**(44)**

B.A. in Chemistry

CHEM 1055, 1056: General Chemistry for Majors	8
CHEM 1065, 1066: General Chemistry for Majors Lab	2
CHEM 2565, 2566:Principles of Organic Chemistry	6
CHEM 2545, 2546: Organic Chemistry Lab	2
CHEM 2154: Analytical Chemistry for Majors	3
CHEM 2164: Analytical Chem Lab for Majors	1
MATH 1015, 1016: Elem. Calc I w/ Trig.	6
MATH 2015, 2016: Elem. Calc. II w/ Trig	6
PHYS 2205, 2206: General Physics	6
PHYS 2215, 2216: Physics Lab	2
Total Credits	**(42)**

Undergraduate Courses (CHEM)

1015-1016: INTRODUCTION TO CHEMISTRY
For students enrolled in curricula other than science or engineering. Chemical principles applied to material, environmental, and life sciences. (Duplicates 1035-1036.) (3H,3C)

1025-1026: INTRODUCTION TO CHEMISTRY LABORATORY
Accompanies 1015-1016, where lab work is required in a student's curriculum. Must be taken concurrently and in phase with lecture sequence, 1015-1016. In both semesters, experiments illustrate principles covered in lecture. (Duplicates 1045-1046.) Co: 1015 for 1025; 1016 for 1026. (3L,1C)

1035-1036: GENERAL CHEMISTRY
Principles of the science, character of the elements and their more important compounds, solution of chemical problems, and important applications. (Duplicates 1015-1016.) (3H,3C)

1035H,1036H: HONORS GENERAL CHEMISTRY
More in-depth treatment of the principles of the science, character of the elements and their more important compounds, solution of chemical problems, and important applications. (Duplicates 1015-1016) (3H,3C)

1045-1046: GENERAL CHEMISTRY LAB
Accompanies 1035-1036. Selected experiments illustrate principles taught in lecture. (Duplicates 1025-1026). Co: 1035H, 1035 for 1045; 1036 for 1046. (3L,1C)

1055-1056: GENERAL CHEMISTRY FOR CHEMISTRY MAJORS
In depth treatment of chemical bonding, thermodynamics, chemical equilibrium, reaction kinetics, descriptive chemistry of the elements, acid-base chemistry, chemistry of gases, liquids and solids, and other topics. This class is restricted to chemistry majors. Co: 1065 for 1055; 1066, 1066 for 1056. (4H,4C)

1055H-1056H: HONORS GENERAL CHEM FOR MAJORS
Co: 1065 for 1055H; 1066, 1066 for 1056H. (4H,4C)

1065-1066: GENERAL CHEMISTRY FOR CHEMISTRY MAJORS LAB
Accompanies 1055-1056. Selected experiments illustrate principles taught in lecture. This class is restricted to chemistry majors. Co: 1055 for 1065; 1056 for 1066. (3L,1C)

2114: ANALYTICAL CHEMISTRY
A first course in analytical chemistry. Topics covered include volumetric and gravimetric analysis, and elementary spectroscopy. Pre: 1036 or 1056. Co: 2124. (3H,3C)

2124: ANALYTICAL CHEMISTRY LABORATORY TECHNIQUES AND PRACTICE
Practical introduction to wet methods of quantitative chemical analysis based on fundamental chemical principles. CHEM 2124 may be substituted for CHEM 3124. Pre: (1046 or 1066), 2114. Co: 2114. (3L,1C)

2154: ANALYTICAL CHEMISTRY FOR CHEMISTRY MAJORS
A one-semester course in analytical chemistry emphasizing the principles of equilibrium with examples from acid-base, complexation, solubility, and redox chemistry. The course also introduces the principles of spectroscopic, electrochemical, and chromatographic instrumentation. Pre: 1036 or 1036H or 1056 or 1056H. Co: 2164. (4H,4C)

2164: ANALYTICAL CHEMISTRY FOR CHEMISTRY MAJORS LAB
A one-semester laboratory course in analytical chemistry that provides practical training in wet chemical methods, atomic and molecular spectroscopy, electrochemistry, and separations. Pre: 1046 or 1066. Co: 2154. (3L,1C)

2424: DESCRIPTIVE INORGANIC CHEMISTRY
Application of fundamental principles in a systematic study of bonding and reactivity of the elements and their compounds. Pre: 1036 or 1056. (3H,3C)

2514: SURVEY OF ORGANIC CHEMISTRY
Short course in fundamentals of organic chemistry with emphasis on nomenclature, isomerism, and properties of organic compounds. Compounds of importance to biology and biochemistry stressed. (Prior credit for 2535 precludes credit for this course.) One year of Chemistry required. (3H,3C)

2535-2536: ORGANIC CHEMISTRY
Structure, stereochemistry, reactions, and synthesis of organic compounds.
Pre: 1036 or 1056 or 1056H or 1036H for 2535; 2535 or (2565 or 2565H) for 2536. (3H,3C)

2545-2546: ORGANIC CHEMISTRY LABORATORY
The laboratory accompanies lectures in organic chemistry 2535 and 2536. Pre: 1046 or 1066 for 2545; 2545 for 2546. Co: 2565, 2535 for 2545; 2536 for 2546. (3L,1C)

2555-2556: ORGANIC SYNTHESIS AND TECHNIQUES LAB
Synthesis and characterization of organic compounds using modern laboratory techniques. Pre: 2566 for 2555; 2555 for 2556. (6L,2C)
2555: II; 2556:

2565-2566: PRINCIPLES OF ORGANIC CHEMISTRY
Organic chemistry for chemistry majors. Structure and reactions of organic compounds, with emphasis on fundamental principles, theories, synthesis, and reaction mechanisms. The subject matter partially duplicates that of 2535-2536; no credit will be given for the duplicated courses. Pre: 1036 or 1056 or 1036H or 1056H for 2565; 2565 for 2566. (3H,3C)

2565H-2566H: PRINCIPLES ORG CHEM
More in-depth treatment of organic chemistry for chemistry majors. Structure and reactions of organic compounds, with emphasis on fundamental principles, theories, synthesis, and reaction mechanisms. The subject matter partially duplicates that of 2535-2536; no credit will be given for the duplicated courses. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY

Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

3114: ANALYTICAL CHEMISTRY FOR LIFE SCIENCES
Introduction to methods of quantitative analysis for students in life sciences curricula. Topics include classical wet methods of gravimetry and titrimetry (acid-base, redox, and complexametric), and instrumental methods of electrochemistry, spectroscopy, and chromatography. Also included are sampling theory and statistical treatment of data. Partially duplicates 2114. Pre: 1036, 1046. (3H,3C)

3124: ANALYTICAL CHEMISTRY LABORATORY FOR LIFE SCIENCES
Accompanies 3114. Laboratory stresses use of wet methods and instrumental techniques for quantitative chemical analysis. CHEM 3124 may be substituted for CHEM 2124. Pre: 1036, 1046. Co: 3114. (3L,1C)

3615-3616: PHYSICAL CHEMISTRY
Principles of thermodynamics, kinetics, and quantum mechanics applied to chemical equilibria, reactivity, and structure. Partly duplicates 4615, cannot receive credit for both 3615 and 4615. Pre: (1036 or 1056), PHYS 2306, MATH 2224 for 3615; 3615, 1036, MATH 2214, (PHYS 2306 or PHYS 2176) for 3616. (3H,3C)
3615: I,II,III; 3616:

3615H-3616H: HONORS PHYSICAL CHEMISTRY
Principles of thermodynamics, kinetics, and quantum mechanics applied to chemical equilibria, reactivity, and structure. Partially duplicates 4615, cannot receive credit for both 3615H and 4615. 3615H requires additional work; consult the instructor. Pre: 1036, (PHYS 2306 or PHYS 2176) for 3615H; 3615, 1036, MATH 2214, (PHYS 2306 or PHYS 2176) for 3616H. (3H,3C) I,II,III.

3625-3626: PHYSICAL CHEMISTRY LABORATORY
Laboratory study of selected physico-chemical principles and methods. Data acquisition, data analysis, and report writing are stressed. Pre: 3615 or 4615 for 3625; 3616, 3625 for 3626. (3L,1C) 3625: I,II; 3626:

4014: SURVEY OF CHEMICAL LITERATURE
Use of the chemical literature as an aid to professional activities. Pre: Junior Major Standing. (1H,1C) I,II.

4074 (MSE 4544): LABORATORY IN POLYMER SCIENCE
Experimental techniques used in the synthesis of various linear polymers, copolymers, and crosslinked networks. Determination of polymer molecular weights and molecular weight distribution. Methods used in the thermal, mechanical, and morphological characterization of polymeric systems. Graduate students in chemistry, P/F only. Pre: 3616, 4534. (1H,3L,2C)

4114: INSTRUMENTAL ANALYSIS
Principles of instrumental methods including data analysis, phase equilibrium, spectroscopy, and electrochemistry. Applications of modern instrumentation to chemical analyses using chromatography, electrophoresis, atomic and molecular spectroscopy, potentiometry, and voltammetry. Note: Graduate students will not be expected to take the corequisite lab 4124. Pre: 3616. Co: 4124. (3H,3C)

4114H: HONORS INSTRUMENTAL ANALYSIS
Pre: 3616. Co: 4124. (3H,3C)

4124: INSTRUMENTAL ANALYSIS LABORATORY
Hands-on experience with modern instrumental methods of analysis. Experiments use spectroscopy, electrochemistry, and separations. Co: 4114. (3L,1C)

4404: PHYSICAL INORGANIC CHEMISTRY
A study of spectroscopic, bonding, and structural properties of inorganic compounds. I Co: 3616. (3H,3C)

4414: INORGANIC CHEMISTRY LAB
Synthesis and characterization of inorganic compounds using modern laboratory techniques. Pre: 4404. Co: 4424, 3616. (6L,2C) II.

4424: DESCRIPTIVE INORGANIC CHEMISTRY
Application of fundamental principles in a systematic study of bonding and reactivity of the elements and their compounds. Pre: 1035, 1036, 1045, 1046. (3H,3C) II.

4514: GREEN CHEMISTRY
Green chemistry applies the principles of prevention of toxic and hazardous waste, and energy efficiency to real world chemical products and processes. Emphasis is on case studies, problem solving, and life cycle analysis. Pre: 2536 or 2566. (3H,3C)

4524: IDENTIFICATION OF ORGANIC COMPOUNDS
Structure determination of organic compounds by spectroscopic methods, with an emphasis on mass spectrometry and nuclear magnetic resonance. Course will emphasize problem-solving skills. I. Pre: (2536 or 2566), (3616 or 4616). (3H,3C)

4534: ORGANIC CHEMISTRY OF POLYMERS
Structure, synthesis, and basic characteristics of the major classes of polymerization reactions including step-growth (condensation) and chain growth (addition), free radical, and ionic mechanisms. Pre: 2536 or 2566. (3H,3C)

4554: DRUG CHEMISTRY
Structure, synthesis, and physiological effects of major classes of pharmaceutical agents including CNS depressants and stimulants, analgesics, anesthetics, cardiovascular agents, chemotherapeutic drugs, and oral contraceptives. Pre: 2536 or 2566. (3H,3C) II.

4615-4616: PHYSICAL CHEMISTRY FOR THE LIFE SCIENCES
Principles of thermodynamics, chemical kinetics, and chemical bonding for students in the life sciences. 4615: Laws and applications of thermodynamics. 4616: Chemical kinetics and chemical bonding including spectroscopy. Partly duplicates 3615, cannot receive credit for 3615 and 4615. Pre: One year of chemistry, physics, and calculus. (3H,3C) I,II.

4634 (MSE 4534): POLYMER AND SURFACE CHEMISTRY
Physical chemical fundamentals of polymers and surfaces including adhesives and sealants. Pre: 3615 or 4615. (3H,3C) II.

4654: ADHESIVE AND SEALANT SCIENCE
Introduction to the fundamental and practical aspects of adhesives and sealants. Emphasis on synthesis of polymeric adhesive and sealant molecules, determination of physical properties of adhesives and sealants, chemical and physical characteristics of adherend surfaces, and mechanical behavior and durability of bonded systems – including metals, composites, polymers, and wood. I Pre: (3615 or 4615). (3H,3C)

4734 (CSES 4734) (ENSC 4734): ENVIRONMENTAL SOIL CHEMISTRY
Chemistry of inorganic and organic soil components with emphasis on environmental significance of soil solution-solid phase equilibria, sorption phenomena, ion exchange processes, reaction kinetics, redox reactions, and acidity and salinity processes. I Pre: CSES 3114, CSES 3124, CHEM 2514 or CHEM 2535, CHEM 3114, MATH 2015. (3H,3C)

4754 (CSES 4754) (ENSC 4754): INSTRUMENTAL ANALYSIS FOR AGRICULTURAL AND ENVIRONMENTAL SCIENCES
Theory and principles of common analytical instruments and their applications to agriculture and environmental science research. Topics include atomic absorption and emission spectroscopy, spectrophotometric methods (UV, visible, luminescence, and automation), chromatography, ion-selective electrodes, and microwave digestion. Infrared spectroscopy, atomic ratio and molecular mass spectroscopy, nuclear magnetic resonance will also be included. Provides hands-on experience with modern analytical instruments. Prerequisites or graduate standing required. Pre: (3114, 3124) or (CSES 3114, CSES 3124). (3H,3L,4C) II.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course. X-grade allowed.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Science

Economics

www.econ.vt.edu/

Aris Spanos, Chair
Professors: R. Ashley; R. Gilles; H. Haller; A. Kats; D. Salehi-Isfahani; A. Spanos; T. N. Tideman; D. Yang
Associate Professors: S. Ball; R. Cothren; N. Lutz
Assistant Professors: M. Mello; S. Ge; J. Yau
University Distinguished Professor Emeritus: J. Buchanan
Professor Emeritus: A. Mandelstamm
Adjunct Professor: J. Cremer
Adjunct Associate Professor: G. Amacher
Undergraduate Advising Director/Career Advisor: N. Lutz (231-7353)

Overview

Specialization in economics prepares a person for a wide variety of careers that emphasize the methods and consequences of analytical decision making in business and government and a broad understanding of the operation of the economy.

Economists are employed in private business and federal, state, and local governments. Economic analysis is directed at a wide range of problems including inflation and recession, environmental problems, taxation decisions, regulatory and antitrust problems, forecasting, and managerial decision making. Undergraduate work in economics also provides an excellent background for further study in law, political science, urban planning, and business administration.

Degree Options

Science majors can earn a specialization within the major. Specializations include Public Policy, Macroeconomics and Finance, and Business Economics, among others. Requirements for the specialization include choosing from a list of related courses and having a high level of performance in both these courses and the rest of the. Students who complete a specialization will be presented at graduation with a Certificate of Specialization. Letters of reference written by the faculty at the student's request can also reflect this achievement.

Degree Requirements

Majors in the College of Science are required to complete the core requirements for the college. The specific requirements for the degree include ECON 2005, 2006; ECON 3104, 3204 and either 3254 or 4304; BIT 2405-2406 or STAT 3005 (the latter is recommended); MATH 1114-1205-1206 (recommended), or 1015-1016-2015 or 1525-1526; and 15 hours of economics electives at the 3000 or 4000 level. The specific requirements are ECON 3104, 3204, 3254 or 4304 and 15 hours of economics electives at the 3000 or 4000 level.

Detailed checklists along with more detailed information can be found on Economics web page: www.econ.vt.edu and in the department undergraduate office.

Minor Requirements

A minor in economics requires ECON 2005, 2006, 3104, 3204, and two additional 3000- or 4000-level economics courses.

5-Year B.A./M.A.

The department offers a 5-year combined bachelor's and master's degree for students with a GPA of at least 3.5. See the undergraduate director for details.

Honors Degree

The department also offers an honors degree. See the undergraduate director for details.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics"), toward the College of Science Core (see first part of this chapter), and toward the degree in economics.

Satisfactory progress toward the B.A. and B.S. in Economics requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination), students must:
    a. Have completed:

Econ 2005: Principles of Economics (micro)	3
Econ 2006: Principles of Economics (macro)	3
Econ 3104: Microeconomic Theory	3
Econ 3204: Macroeconomic Theory	3
Stat 3005 or BIT 2406	3
Total Credits	**15**

    b. Be registered in at least two 3-credit ECON courses during each on-campus semester of the regular academic year unless they have completed all ECON courses required for graduation;
    c. Achieve a GPA of 2.0 or better in the major no later than having **attempted** 72 hours toward the degree;
    d. Not repeat any ECON course required in the major more than once;
    e. Not repeat more than 3 ECON courses in the major.
2. Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above.

Course Descriptions (ECON)

2005-2006: PRINCIPLES OF ECONOMICS
2005: Microeconomics. Consumer behavior and demand, firm behavior and supply, price determination and market equilibrium under varying industry structure. Applications to labor and financial markets. 2006: Macroeconomics. Measuring aggregate economic activity, macroeconomic problems (such as unemployment and inflation), the monetary system, effects and limitations of monetary and fiscal policies. (3H,3C)

2025H,2026H: HONORS PRINCIPLES OF ECONOMICS
2025H: Microeconomics. Consumer behavior and demand, firm behavior and supply, price determination and market equilibrium under varying industry structure. Applications to labor and financial markets. 2026H: Macroeconomics. Measuring aggregate economic activity, macroeconomic problems (such as unemployment and inflation), the monetary system, effects and limitations of monetary and fiscal policies. (3H,3C)

3004: CONTEMPORARY ECONOMIC ISSUES
The economic analysis of current issues and problems. This course may be repeated with different topic. Pre: 2006 or 2115 or 2125 or 2026H. (3H,3C)

3014: ECONOMICS OF POVERTY
Economic analysis of poverty in America. Income distribution, definition and incidence of poverty, particularly among ethnic minorities and female-headed households. Causes and consequences of poverty, including: changes in the structure of the economy, changes in family structure, discrimination, the "culture of poverty", rural poverty, and homelessness. Analysis of public policies designed to alleviate poverty, including welfare, social security, and affirmative action policies in employment and in education. I (3H,3C)

3024: ECONOMIC JUSTICE
This course explores how different assumptions regarding the basis of claims for access to economic resources lead to different outcomes. Students will explore a variety of theories and examine their own beliefs about economic justice. Pre: (2005 or 2025H), (2006 or 2006H). (3H,3C)

3104: MICROECONOMIC THEORY
Theories of demand, production, perfectly and imperfectly competitive price determination, and general market equilibrium. Analytic applications. Pre: Must complete ECON 2005 (with a C or better) and obtain (1) a C- or better in MATH 1205, 1206, and 1114 or (2) a B- or better in MATH 1525 and 1526 or (3) a B- or better in MATH 1015, 1016 and 2015. Pre: 2005, (MATH 1205, MATH 1206, MATH 1114) or (MATH 1525, MATH 1526) or (MATH 1015, MATH 1016, MATH 2015) or (MATH 1205, MATH 1526) or (MATH 1016, MATH 1526) or (MATH 1205, MATH 2015, MATH 1114). (3H,3C)

3114: APPLIED MICROECONOMICS
Application of microeconomic theory in the analysis of policy issues and problems. Topics may include: welfare programs, substance abuse regulation, federalism, technical change, information economics, market regulation. Pre: (3104 or 4104H), (3254 or 4304). (3H,3C)

3204: MACROECONOMIC THEORY
Theories of the determination of the level of aggregate economy-wide activity. Employment, the price level, aggregate national income, and the interest rate. The roles of money and expectations. Pre: (2006 or 2115 or 2125 or 2026H), (3104 or 4104H), (MATH 1206 or MATH 1526 or MATH 2015). (3H,3C)

3214: MONEY AND BANKING
Money and credit. The U.S. monetary system. Monetary theory, monetary policy and economic stabilization. Pre: (2005 or 2025H), 2006. (3H,3C)

3224: APPLIED MACROECONOMICS
An introduction to macroeconomic policy analysis. Coverage of both empirically based theoretical issues and microcomputer based simulation of policy alternatives. Pre: 3204, (3254 or 4304). (3H,3C)

3254: ANALYSIS OF ECONOMIC DATA
Sources of economic data. Application of spreadsheet and/or statistical software to analysis of economic relationships using graphical and regression techniques. Emphasis is on economic applications rather than statistical theory. Pre: (BIT 2405 or MSCI 2405, BIT 2406 or MSCI 2406) or STAT 3005 or STAT 4604 or STAT 4705 or STAT 4714. (3H,3C)

4014: ENVIRONMENTAL ECONOMICS
Economic dimensions and aspects of programs designed to impose quality controls upon the environment. Special emphasis on problems of controlling air and water pollution. Pre: 2005 or 2116 or 2126 or 2025H. (3H,3C)

4024: HISTORY OF ECONOMIC THOUGHT
Review of the emergence of economics as a discipline and science in England. Surveys of major thinkers, doctrines and theories, with emphasis on the policy issues that motivated their work. Pre: 2006. (3H,3C)

4034: COMPARATIVE ECONOMIC SYSTEMS
Analysis of national economies, emphasizing structure differences, and differences in efficiency and distributive outcome which result from primary reliance on decentralized (market) allocation or centrally directed(planned) allocation. Pre: 2006. (3H,3C)

4044: PUBLIC ECONOMICS
Economic rationale of the public sector. Proper size and functions of government. Market failure, Cost-benefit analysis, public goods provision. Pricing of public enterprise services. Pre: 3104 or 2025H. (3H,3C)

4054: PUBLIC FINANCE
The structure and incidence of taxation in the U.S. Effects of taxes on incentives and economic efficiency. Tax Policy. Pre: 3104 or 2025H. (3H,3C)

4064: COLLECTIVE DECISIONS
Economic analysis of methods for group decision making, voting rules, voting strategies and outcomes; cost-sharing problems; efficiency and equity impacts of government action. Pre: 3104 or 2025H. (3H,3C)

4074: LABOR ECONOMICS
Human capital theory, labor supply and demand, discrimination, effects of labor unions and collective bargaining, wage differentials, income distribution. Pre: (2005 or 2116 or 2126 or 2025H, 3254). (3H,3C)

4084: INDUSTRY STRUCTURE
The structure and performance of American industry. Dimensions and measures of market structure. Factors affecting market structure. The relationship between structure and performance. Purpose and effects of antitrust policy, regulation, and other public policies toward industry. Pre: 3104 or 4924 or 3104 or 4924. (3H,3C)

4094: PUBLIC UTILITY AND TRANSPORTATION ECONOMICS
Policy issues centering on natural monopolies, such as transportation and utility networks. Profit and rate regulation, marginal cost pricing, public ownership. Issues of equity and efficiency in regulation of industry. Pre: 3104. (3H,3C)

4124: GROWTH AND DEVELOPMENT
Theories of economic growth. Policies to foster growth, and their consequences. Pre: 2006, (2025H or 3104). (3H,3C)

4135,4136: INTERNATIONAL ECONOMICS
4135 International Trade: Factor mobility and commercial policy (tariffs, quotas, export licensing). 4136 International Finance: Liquidity, exchange rates, comparative international living standards, foreign aid. Pre: 3104 or 2025H for 4135; 3204 or 4204H for 4136. (3H,3C)

4144: ECONOMICS OF CHINA
Evolution of the Chinese economy since 1949. Exposition of alternative economic systems, the commune, incentive problems, and state owned enterprises. Analysis of recent reforms and their effects on economic efficiency; and key issues of economic transition related to Russia and other East European countries. Pre: (3104 or 2025H). (3H,3C)

4214: ECONOMICS OF HEALTH CARE
Effects of medical care on health; cost and production of medical care; demand for medical care and its financing; structure of the health care industry; reorganization for efficiency. Pre: 2005 or 2025H. (3H,3C)

4224: U. S. ECONOMIC HISTORY
U.S. economic history from the colonial period to the present. Structure and performance of the U.S. economy, including growth and development,

with attention to the interplay between economics and politics. Pre: 2005, 2006. (3H,3C)

4304: INTRODUCTION TO ECONOMETRIC METHODS
An introduction to econometric modeling techniques, including regression methods. Particular emphasis on the special problems posed by economic data. Pre: STAT 3005. Co: 3204, 3104. (3H,3C)

4404: ECONOMICS OF ORGANIZATIONS
Economic theories of organization, with specific attention to their internal structure, and to design of incentive systems. Application to mergers, to the relationship between stockholders and managers, etc. Students with one year of economics, calculus and major in some other social science, by permission of the instructor. Pre: 3104 or 4924 or 2025H. (3H,3C)

4414: ECONOMIC FORECASTING
An introduction to economic forecasting -- theory, methods, and applications. Pre: 2006. (3H,3C)

4424: THE THEORY OF GAMES AND ECONOMIC BEHAVIOR
Introduction to games and solution concepts, such as prisoner's dilemma, noncooperative equilibrium and Nash's bargaining solution. These concepts are applied in analyzing economic problems including bargaining problems, oligopoly and agency. Pre: 3104 or 4104H. (3H,3C)

4434: EXPERIMENTAL ECONOMICS
This is a course in the use of laboratory methods to study behavior in economics and the social sciences. Students will study state-of-the-art methodology in experimental economics, including experimental design, laboratory technique, financial incentives, and analysis of data. Students will participate in, design, and conduct experiments in bargaining, auctions, asset markets, public goods and commons situations, and risky decision-making. Pre: (3104 or 2025H), (BIT 2406 or MSCI 2406 or STAT 2004 or STAT 3005). (3H,3C)

4704: URBAN ECONOMY
The economics of urbanization. Land values, location decisions, problems of transportation congestion, housing markets, and land use regulation. Pre: 2005. (3H,3C)

4754: INTERNSHIP
Qualified students are placed in an industry or government position under the combined supervision of a faculty member and a responsible supervisor in the employing agency. Satisfactory evaluation from employer, detailed reports on the internship experience and a specific project will be required of each intern. Pre: Junior standing, QCA of 2.50 or better and consent. Pass/Fail only. Variable credit course. X-grade allowed. Pre: 2005.

4894: LAW AND ECONOMICS
Analysis of the economic effects of legal rules, with emphasis on the law of property, contract, liability, and land use. Pre: 2005. (3H,3C)

4924: MANAGERIAL ECONOMICS
Economics of managerial decision-making. Production theory and cost, theory of the firm, market structure and firm interactions. Pre: 2005, MATH 1526 or MATH 1206 or MATH 2015. (3H,3C)

4964: FIELD STUDY
Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Science

Geosciences

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K. A. Eriksson, Chair
J. A. Spotila, Associate Chair
University Distinguished Professor: R.J. Bodnar; M.F. Hochella, Jr.
Professors: R.J. Bodnar; P.M. Dove; K.A. Eriksson; M.F. Hochella, Jr.; S.D. King; M.J. Kowalewski; R.D. Law; J. F. Read; J.D. Rimstidt; N.L. Ross; R.J. Tracy, S. Xiao
Associate Professors: T.J. Burbey; J.A. Hole; M. E. Schreiber; J.A. Spotila; C.J. Weiss
Assistant Professors: B.M. Bekken; Y. Zhou
Research Professors: R.J. Angel; R.P. Lowell
Research Assistant Professor: M.C. Chapman
Adjunct and Affiliated Faculty: J. Beard; J Chermak; B. DeVivo; A. Dooley; N. Fraser; W. Henika; J. Hunter; R. Koepnick; M. Mikulich; C. Szabo; L. Ward; C. Watts

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Overview

Geosciences offer exciting opportunities for students with an interest in applying a full range of science and mathematical skills to understand the earth's properties and dynamic processes. This is a highly interdisciplinary program that applies physics, chemistry, biology, and mathematics to understand and manage all aspects of Earth and the environment. Geoscientists work everywhere in the world under almost any condition as they search for earth resources, manage the environment and natural hazards, and supervise technical and business enterprises. For more information about exciting careers in Geosciences consult earthinspace.org/careers/, www.agiweb.org/careers.html, and www.bls.gov/oco/ocos050.htm. The extensive scientific and mathematical skills of geoscientists, along with their broad field experience, allow them to pursue careers in many related fields ranging from material science to technical management to scientific reporting.

The internationally recognized faculty in Geosciences has developed four challenging options, described below, that lead to a B.S. in Geosciences. Coursework emphasizes the acquisition and processing of field data beginning with a special course in field methods taken in the spring of the first year. The geology option requires, and the other options recommend, that the student participate in a six-week field camp. The B.S. in Geosciences provides pre-professional preparation that will allow students to continue their education in post graduate programs in science, law, and business.

Earth systems and processes are enormously complicated and require a full range of intellectual skills to decipher and manage. Geoscientists must possess good quantitative skills and a solid understanding of physics, chemistry, and biology. They must be able to read maps, identify rocks, minerals, and fossils as well as visualize earth structures in three dimensions. They must have strong communication skills, both written and verbal. Learning to use these skills in an integrated way is a challenging and rewarding experience.

Geology Option

The Geology option offers a detailed coverage of the broad range of classic disciplines within the geosciences. This option emphasized the study of minerals, rocks and fossils, and teaches the student how to understand the processes and history of the earth based on the occurrences and relationships of these materials at or near the Earth's surface. The required curriculum for undergraduates pursuing the B.S. in Geosciences with a option in Geology are; BIOL 1105, 1106, 1115, 1116 (8C); CHEM 1035, 1036, 1045, 1046 (8C); GEOS 1004, 1005, 1014, 1104, 2444, 3104, 3204, 3404, 3504, 3604, 3704, 4024, 4494, 4000 level courses (50C); MATH 1114, 1205, 1206, 1224, 2224 (13C); PHYS 2305, 2306 (8C); STAT 3005 (3C); free electives (6C).

Geochemistry Option

The Geochemistry option is designed for those students who have special interest in the chemical aspects of the Earth and its materials. The required curriculum for undergraduates pursuing the B.S. in Geosciences with an option in Geochemistry are: CHEM 1035, 1036, 1045, 1046, plus 10 additional credits selected from 2114, 2124, 2514, 2535, 2536, 2545, 2546, 3114, 3124, 3615, 3625, 4615, 4616, or 4424 (18C); GEOS 1004, 1005, 1014, 1024, 1104, 1124, 2444, 3104, 3204, 3404, 3504, 3604, 3704, 4024, 4634, 4974 (43C); MATH 1114, 1205, 1206, 1224, 2214, 2224 (16C); PHYS 2305, 2306 (8C); STAT 3005 (3C); 3-4000 level additional courses from the Departments of Biochemistry, Biological Sciences, Chemical Engineering, Chemistry, Civil and Environmental Engineering, Computer Science, Crop and Soil Environmental Sciences, Engineering Science and Mechanics, Geosciences, Materials Science and Engineering, Mathematics, Mining and Minerals Engineering, Physics, or Statistics (7C); free electives (4C).

Geophysics Option

The Geophysics option offers the student the opportunity to specialize in the branch of the geosciences that investigates physical earth processes such as earthquakes and that images the interior of the earth through surface-based physical measurements. The required courses for the B.S. in Geosciences with an option in Geophysics are: CHEM 1035, 1036, 1045, 1046 (8C); CS 1044 (3C); GEOS 1004, 1005, 1014, 1104, 2444, 3104, 3204, 3404, 3504, 3604, 3704, 4024, 4124, 4154, 4164, 4174, (46C); MATH 1114, 1205, 1206, 1224, 2214, 2224 (16C); PHYS 2305, 2306 (8C); Science/Math courses (6C); STAT 3005 (3C); free electives (6C).

Earth Science Education Option

The Earth Science education option provides students with a broad earth science curriculum that meets the content goals for secondary earth science teaching. Certification for Earth science teaching is not provided in the program. Information about teaching certification in Virginia can be obtained from the Department of Teaching and Learning. The courses required to complete a B.S. in Geosciences with an option in Earth Science Education are: BIOL 1105, 1106, 1115, 1116 (8C); CHEM 1035, 1036, 1045, 1046, 2514 (11C); GEOS 1004, 1005, 1014, 1024, 1104, 1124, 2444, 3034, 3104, 3114, 3204, 3404, 3504, 3604, 3704, 4024, 3-4000 courses (48C); MATH 1114, 1205, 1206, 1224 (10C); PHYS 1055, 1115, 2305, 2306 (12C); STAT 3005 (3C); free electives (7C).

Minor in Geosciences

Requirements include GEOS 1004, 1014, 1104 (8C); plus 3-4000 level courses in geosciences (12C). GEOS 2104 duplicates GEOS 1004 for 3 credits only. GEOS 4974 and 4994 may not be used toward the minimum of 20 total credits

Graduate Program

The department offers M.S. and Ph.D. degrees in geosciences with specializations in many sub-disciplines. (See the *Graduate Catalog* for further information.)

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the College of Science Core (see first part of this chapter) and toward the degree in geosciences.

Satisfactory progress toward the B.S. in Geosciences, **Geology option**, requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal policy), students must have completed:

CHEM 1035, 1036: General Chemistry	6
CHEM 1045, 1046: General Chemistry Lab	2
ENGL 1105, 1106: Freshman English	6
GEOS 1004: Physical Geology	3
GEOS 1005: Geoscience Fundamentals	1
GEOS 1104: Physical Geology Lab	1
GEOS 1014: The Earth and Life Through Time	4
GEOS 3104: Elementary Geophysics	3
GEOS 3404: Structural Geology	3
GEOS 3504: Mineralogy	3

MATH 1114: Elementary Linear Algebra	2
MATH 1205,1206: Calculus	6
MATH 1224: Vector Geometry	2
MATH 2224: Multivariable Calculus	3
PHYS 2305, 2306: Foundations of Physics	8
Total Credits	**53**

2. Upon having **96** semester credits, students must have an in-major grade point average of 2.0 or above.

- Satisfactory progress toward the B.S. in Geosciences, **Geochemistry** option, requires that:

1. Upon having attempted **72** semester credits (including transfer, advanced placement, advanced standing, and credit by examination, course withdrawal policy), students must have completed:

CHEM 1035, 1036: General Chemistry	6
CHEM 1045, 1046: General Chemistry Lab	2
Chemistry electives	7
ENGL 1105, 1106: Freshman English	6
GEOS 1004: Physical Geology	3
GEOS 1005: Geoscience Fundamentals	1
GEOS 1104: Physical Geology Lab	1
GEOS 1014: The Earth and Life Through Time	4
GEOS 3504: Mineralogy	3
MATH 1114: Elementary Linear Algebra	2
MATH 1205, 1206: Calculus	6
MATH 1224: Vector Geometry	2
MATH 2214: Differential Equations	3
MATH 2224: Multivariable Calculus	3
Total Credits	**49**

2. Upon having **96** semester credits, students must have an in-major grade point average of 2.0 or above.

- Satisfactory progress toward the B.S. in Geosciences, **Geophysics** option, requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal policy), students must have completed:

CHEM 1035, 1036: General Chemistry	**6**
CHEM 1045, 1046: General Chemistry Lab	**2**
ENGL 1105, 1106 : Freshman English	**6**
GEOS 1004: Physical Geology	**3**
GEOS 1005: Geosciences Fundamentals	**1**
GEOS 1104: Physical Geology Lab	**1**
GEOS 1014: The Earth and Life Through Time	**4**
GEOS 3104: Elementary Geophysics	**3**
GEOS 3404: Structural Geology	**3**
GEOS 3504: Mineralogy	**3**
MATH 1114: Elementary Linear Algebra	**2**
MATH 1205, 1206: Calculus	**6**
MATH 1224: Vector Geometry	**2**
MATH 2214: Differential Equations	**3**
MATH 2224: Multivariable Calculus	**3**
PHYS 2305, 2306: Foundations of Physics	**8**
Total Credits	**56**

2. Upon having 96 semester credits, students must have an in-major grade point average of 2.0 or above.

- Satisfactory progress toward the B.S. in Geosciences, **Earth Science Education** option, requires that:

1. Upon having attempted **72** semester credits (including transfer, advanced placement, advanced standing, and credit by examination, course withdrawal policy), students must have completed:

CHEM 1035, 1036: General Chemistry	6
CHEM 1045, 1046: General Chemistry Lab	2
ENGL 1105, 1106: Freshman English	6
GEOS 1004: Physical Geology	3
GEOS 1005: Geoscience Fundamentals	1
GEOS 1104: Physical Geology Lab	1
GEOS 1014: The Earth and Life Through Time	4
GEOS 2444: Geoscience Field Observations	2
GEOS 3104: Elementary Geophysics	3
GEOS 3404: Elements of Structural Geology	3
GEOS 3504: Mineralogy	3
MATH 1114: Elementary Linear Algebra	2
MATH 1224: Vector Geometry	2
MATH 1205, 1206: Calculus	6
PHYS 2205, 2206: General PhysicsPHYS 2305, 2306 Foundations of Physics	8
Total Credits	**50**

2. Upon having **96** semester credits, students must have an in-major grade point average of 2.0 or above.

Undergraduate Courses (GEOS)

1004: PHYSICAL GEOLOGY
Minerals and rocks, internal and external processes especially the modification of landscape, global plate tectonics, and their interrelationships; introduction to the more direct aspects of human interactions with the natural physical environment. (3H,3C)

1005-1006: GEOSCIENCE FUNDAMENTALS
Introduction to professional expectations and career options for students pursuing a degree in Geosciences. 1005: Scientific methodology, empirical reasoning, and the specific application of these methods to the Geosciences. Introduction to accessing and using geoscientific resources, computer graphics and database applications in geoscience, and methods of oral and written technical communication. 1006: Career opportunities in geoscience, introduction to research, GIS applications in geoscience, case studies of applied geoscience.
Co: 1004 for 1005; 1014 for 1006. (3L,1C)

1014: THE EARTH AND LIFE THROUGH TIME
Scientific examination of rocks, fossils, and the earth's interior as clues to global-scale geological and biological processes that have shaped our planet and its biosphere through time. Origin and physical evolution of the earth, oceans, and atmosphere; origin and evolution of life; plate tectonics and mountain-building events; global climate changes; major evolutionary innovations; mass extinction events. (3H,3L,4C)

1024: RESOURCES GEOLOGY AND THE ENVIRONMENT
The nature, origin, occurrence, distribution, use, and limitations of the earth's mineral resources including abundant and scarce metals, precious metals and gems, building materials, industrial minerals, fossil fuels, nuclear energy, water, soils, and other minerals. (3H,3C)

1104: PHYSICAL GEOLOGY LABORATORY
Identification of minerals and rocks; topographic maps and air photographs and their use in understanding landscape and geologic influences on human activities; geologic maps. (3L,1C)

1124: RESOURCES GEOLOGY AND THE ENVIRONMENT LABORATORY
Laboratory exercises dealing with the nature of mineral resources, how they are exploited, and the practical concerns associated with their extraction. (3L,1C)

2014: MISSION TO THE PLANETS
The physical, chemical, and geological nature of the terrestrial planets and their atmospheres; similarities and differences between the Earth and other terrestrial planets; manned and unmanned space probes and how they have shaped our understanding of the planets. (3H,3C)

2104: ELEMENTS OF GEOLOGY
Structure of the earth, properties of minerals and rocks, and geologic processes that act on the surface and in the interior of the earth, and integrated geologic systems of importance in engineering and regional planning. For students in engineering and physical sciences. Geology 2104 duplicates material in Geology 1004 and both may not be taken for credit. (2H,3L,3C)

2444: GEOSCIENCE FIELD OBSERVATIONS
Study of geological phenomena in the field. Students make observations in the field, integrate them into coherent datasets, and construct interpretations. Rock type and structure identification in outcrop. Field techniques and applications in structural geology, sedimentology, stratigraphy, geomorphology, environmental geology, hydrogeology, geochemistry, and geophysics. 10 full days spent in the field (Mondays through Fridays during Summer I), plus additional classroom or laboratory meetings. Pre: 1004, 1014, 1104. (6L,2C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course. X-grade allowed.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course. X-grade allowed.

3014: ENVIRONMENTAL GEOSCIENCES
The roles of geology and geophysics in defining and monitoring the natural environment, with special application to interactions between humans and the geologic environment. Both descriptive treatment and quantitative concepts related to environmental processes involving the solid earth and earth's surface, with emphasis on geologic hazards (e.g., earthquakes, volcanoes, landslides and slope failures, flooding, groundwater problems, mineral and rock dusts). Pre: 1004 or 1024 or 2104. (3H,3C)

3024: FORTRAN FOR PHYSICAL SCIENCE
Computer programming using Fortran 95 with applications to physical science, including statistics, physics, geology, and hydrology. Applications used to expose students to the capabilities of the language will include arrays, I/O concepts, structured programming, data types, procedures and modules, and dynamic data structures. Pre: MATH 1114, MATH 1206 or MATH 2015. (3H,3C)

3034: OCEANOGRAPHY
Descriptive and quantitative treatment of the geological, physical, chemical and biological processes that occur in, or are influenced by, the oceans. The history of oceanic exploration and discovery is addressed. Pre: MATH 1206 or MATH 2015. (3H,3C)

3104: ELEMENTARY GEOPHYSICS
Acquisition and interpretation of exploration geophysical data. Seismic reflection and refraction methods, gravity and magnetic fields, geoelectrical methods, and geophysical well logging. Pre: MATH 1205. (2H,3L,3C)

3114 (GEOG 3114): INTRODUCTION TO METEOROLOGY
A nonmathematical introduction to meteorology including consideration of the structure of the atmosphere, energy balance in the atmosphere, clouds and precipitation, air masses and fronts, global circulation, storms, climatology, catastrophic weather, meteorological optics, and forecasting. (2H,3L,3C)

3204: SEDIMENTOLOGY-STRATIGRAPHY
Study of sedimentary basins in a plate-tectonic framework, mechanisms of basin formation, three-dimensional geometry of basin fill, and controls on basin fill. Siliciclastic and carbonate-evaporate rocks as examples of basin fill are discussed in lectures and studied in the lab and in the field. Applied aspects of the course include a discussion of geometries of sedimentary aquifers and reservoirs. Pre: 1004 or 1014. (2H,3L,3C)

3304 (CSES 3304) (GEOG 3304): GEOMORPHOLOGY
Examines the variety of landforms that exist at the earth's surface. Detailed investigation of major processes operating at the earth's surface including: tectonic, weathering, fluvial, coastal, eolian, and glacial processes. Field excursion. Pre: GEOG 1104 or GEOS 1004 or GEOS 2104. (3H,3C)

3404: ELEMENTS OF STRUCTURAL GEOLOGY
Introduction to basic geological structures, evolution of microfabrics, development of faults, folds and foliations, stereographic analysis of geological structures, thrust fault geometries, balancing of geological cross-sections, and introduction to the concepts of stress and strain. Pre: 1004. (2H,3L,3C)

3504 (MSE 3104): MINERALOGY
Principles of modern mineralogy, crystal chemistry, and crystallography, with emphasis on mineral atomic structure and physical property relationships, mineralogy in the context of geology, geochemistry, environmental science and geophysics, phase equilibria, mineral associations, and mineral identification, and industrial applications of minerals. There are three required field trips during the semester. Pre: MATH 1205, CHEM 1036. (2H,3L,3C)

3524 (MSE 3124): OPTICAL MINERALOGY
Principles of color and the behavior of light in crystalline materials; use of the petrographic microscope in the identification of minerals using optical techniques. Pre: 1004. Co: 3504. (3L,1C)

3604: PALEONTOLOGY
Paleontological principles and techniques and their application to the evolution of life, the ecological structure of ancient biological communities, the interpretation of ancient depositional environments, and the history of the earth. Pre: 1004, 1014. (2H,3L,3C)

3614 (CSES 3114) (ENSC 3114): SOILS
Characterization of soils as a natural resource emphasizing their physical, chemical, mineralogical, and biological properties in relation to nutrient availability, fertilization, plant growth, land-use management, waste application, soil and water quality, and food production. For CSES, ENSC, and

related plant- and earth-science majors. Partially duplicates CSES/ENSC 3134. Pre: CHEM 1036. (3H,3C)

3624 (CSES 3124) (ENSC 3124): SOILS LABORATORY
Parent materials, morphology, physical, chemical, and biological properties of soils and related soil management and land use practices will be studied in field and lab. Partially duplicates CSES/ENSC 3134. Co: 3614. (3L,1C)

3704: IGNEOUS AND METAMORPHIC ROCKS
Study of characteristics and mechanisms of igneous intrusion at depth in the crust, volcanic phenomena on the surface, and textural and mineralogical modification of rocks at elevated temperatures and pressures of crustal metamorphism. Tectonic aspects of igneous and metamorphic rocks will be stressed. Pre: 1004, 1014. Co: 3504. (2H,3L,3C)

4024: SENIOR SEMINAR
Investigation and solution of significant geologic research problems by analysis and integration of information across a wide spectrum of Geosciences subdisciplines, and the presentation of results in oral and written form. Research projects will provide maximum student exposure to the full breadth of the Geosciences and the interrelated nature of subdisciplines. Pre: 3104, 3204, 3404, 3504, 3604, 3704. (3H,3C)

4084 (GEOG 4084): INTRODUCTION TO GIS
Use of automated systems for geographic data collection, digitization, storage, display and analysis. Basic data flow in GIS applications. Overview of GIS applications. Group homework projects to develop proficiency in the use of current GIS software. Prior experience with personal computers recommended. (3H,3C)

4124: SEISMIC STRATIGRAPHY
Overview of seismic data acquisition and processing methods, seismic wavelets, static and dynamic corrections, and seismic velocities; seismic reflection data interpretation; seismic reflection responses Seismic mapping; seismic stratigraphy and seismic lithology. Consent required. Pre: 3104. (2H,3L,3C)

4154: EARTHQUAKE SEISMOLOGY
Seismicity and its causes in the context of plate tectonics; determination of earthquake location, size and focal parameters; seismogram interpretation; seismometry; hazard potential; use of earthquakes in determining earth structure. Pre: MATH 2214, MATH 2224, PHYS 2305, GEOS 3104. (2H,3L,3C)

4164: POTENTIAL FIELD METHODS IN EXPLORATION GEOPHYSICS
Theory and application to engineering, environmental, and resource exploration. Gravity, magnetics, electrical resistivity, self potential, induced polarization, ground-penetrating radar, magnetotellurics, electromagnetic induction. Pre: 3104, MATH 2214, MATH 2224, PHYS 2306. (3H,3L,4C)

4174: EXPLORATION SEISMOLOGY
Theory and application of seismic methods to engineering, environmental and resource exploration: reflection seismics, refraction seismics, and tomography. Data acquisition, digital filtering, data corrections, imaging, interpretation, and forward modeling. Pre: 3104, MATH 2224, PHYS 2305, PHYS 2306. (3H,3L,4C)

4324 (BIOL 4324): PLANT EVOLUTION (WRITING INTENSIVE)
Geological history, comparative morphology, evolution and systematics of pre-vascular and vascular plants. Focus on evolution of communities, adaptive construction of tissues and organs, and ecology of reproduction. Pre: BIOL 2304. (2H,6L,4C)

4354 (GEOG 4354): INTRODUCTION TO REMOTE SENSING
Theory and methods of remote sensing. Practical exercises in interpretation of aerial photography, satellite, radar and thermal infrared imagery. Digital analysis, image classification and evaluation. Applications in earth sciences, hydrology, plant sciences, and land use studies. (2H,3L,3C)

4404: ADVANCED STRUCTURAL GEOLOGY
Basic principles of rock behavior under applied, non-hydrostatic stress (experimental and tectonic) and analysis of the geometrical patterns produced. Alternate years. Pre: 3404. (2H,3L,3C)

4414: ENGINEERING GEOLOGY
The geological principles and techniques that are required in civil engineering projects and the influence of geology on design, location, construction, and stability of engineering structures. Pre: 1004 or 2104. (2H,2C)

4494: GEOLOGY SUMMER FIELD COURSE
Synthesis of course work through field mapping and studies of topical areas in soft- and hard-rock terrains. Geology of the southern Appalachian Blue Ridge and Valley and Ridge Provinces. Training in field methods and techniques. Consent required. Pre: 1004, 1014, 3404. (2H,48L,6C)

4554: GEOLOGIC ASPECTS OF NUCLEAR AND TOXIC WASTE DISPOSAL
Review of the geochemical characteristics of radionuclides and other toxic, inorganic materials and how these characteristics affect safe disposal of these materials in the natural environment. Examination of the effects of near-surface geologic processes such as groundwater movement and geologic hazards on long-term storage of nuclear wastes, with application to evaluation of current and proposed disposal sites. Pre: CHEM 1036. (2H,3L,3C)

4624: MINERAL DEPOSITS
Introduction to the range and variety of metallic and non-metallic economic mineral deposits. Classification of the petrologic and tectonic settings of mineral deposits. Source, transport and depositional mechanisms of mineral deposit formation. Laboratory emphasizes identification of ore minerals, gangue minerals, common host rocks, wall-rock alteration and mineral zoning. Pre: (1004 or 2104), (3104 or 3404). (2H,3L,3C)

4634: ENVIRONMENTAL GEOCHEMISTRY

Application of quantitative methods of thermodynamic and physicochemical analysis to the study of the distribution and movement of chemical elements in surface and near-surface geological environments. Emphasis on practical approaches to environmental geochemistry. Pre: MATH 1205, CHEM 1036. (2H,3L,3C)

4644: ORGANIC GEOCHEMISTRY
Composition, origin and distribution of organic matter in the geological environment; the carbon cycle; terminology and structure of organic molecules; metamorphism of organic materials; formation and composition of coal, oil, natural gas; organic geochemistry of the oceans; role of organics in ore formation; organic compounds in natural waters; abiogenic organic compounds in magmatic rocks and fluids. Pre: 1004 or 2104, 1014 or 1024, CHEM 1036. (3H,3C)

4714: VOLCANOES AND VOLCANIC PROCESSES
Study of characteristics and mechanisms of volcanic phenomena, including magma dynamics, origin and chemistry of lavas, physics of eruptions, and characteristics of volcanic products, particularly pyroclastic deposits. Includes focus on volcanism as a general planetary process, on terrestrial tectonic settings of volcanism and on volcanic hazards. Pre: 3704. (2H,3L,3C)

4804: GROUNDWATER HYDROLOGY
Physical principles of groundwater flow, including application of analytical solutions to real-world problems. Well hydraulics. Geologic controls on groundwater flow. Pre: (1014, PHYS 2205) or (PHYS 2305, MATH 1206). (2H,3L,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
May be repeated for a maximum of 4 credits. Variable credit course.

TOP

Mathematical Sciences (MASC)

The departments of computer science, mathematics, and statistics have joined together to offer the following introductory, interdisciplinary courses in mathematical sciences:

1024: MATHEMATICS, A LIBERAL ARTS APPROACH
This is the first course in a sequence that is intended to give those students who will not make extensive use of the Mathematical Sciences in their specialties some insight into Mathematics, Computer Science, and Statistics in an integrated setting. Topics include set theory, number theory, and modular arithmatic. MASC 1024 duplicates 1615. Prior credit for MASC 1025 or three or more hours of mathematics at the 2000 level or higher precludes credit for this sequence. I (3H,3C)

1034: STATISTICS, A LIBERAL ARTS APPROACH
Intended to provide those students who will not make extensive use of the mathematical sciences in their specialties some insight into the concepts of statistics. Topics include sampling and opinion polls, role of experimentation, descriptive statistics, tabular and graphical organization of data, relationships between variables, economic and social indicators, and the study of randomness. Prior credit for any of the following precludes credit for MASC 1034: MSCI 2405; 3 hours of 2000-level or higher statistics. Pre: 1024. (4H,3C)
II.

1044: COMPUTER SCIENCE, A LIBERAL ARTS APPROACH
Intended to provide those students who will not make extensive use of the mathematical sciences in their specialties some insight into the concepts of computer science. Topics include introduction to computer architecture, operating systems, programming languages, and algorithms; history of computing; computer applications in the modern world. Prior credit for any of the following
precludes credit for 1044: CS 1104, 1704, or any computer science course at the 2000 level or higher. (3H,3C) II.

College of Science

Mathematics

www.math.vt.edu/

Peter Haskell, Head
Associate Head for Undergraduate Students, C. J. Parry
Director for Undergraduate Programs: R. Rogers
Graduate Director: J. Borggaard
Hatcher Professor of Mathematics: J. A. Burns
Virginia Tech Class of 1950 Mathematics Professors: M. Renardy and Y. Renardy
Alumni Distinguished Professor: E. Brown
Professors: S. Adjerid; J. A. Ball; C. A. Beattie; J. Borggaard; M. V. Day; W. J. Floyd; E. L. Green; W. Greenberg; G. A. Hagedorn; P. E. Haskell; T. L. Herdman; J. U. Kim; M. Klaus; W. E. Kohler; R. Laubenbacher; T. Lin; P. A. Linnell; G. Lloyd; C. J. Parry; C. L. Prather; F. Quinn; R. C. Rogers; J. F. Rossi; D. L. Russell; M. Shimozono; R. L. Snider; S. Sun; J. Turner; R. L. Wheeler
Associate Professors: E. de Sturler; D. Gao; S. Gugercin; T. Iliescu; J. E. Shockley; P. Wapperom; M. Williams
Assistant Professors: A. Elgart; N. Loehr; H. Mortveit; A. Norton; P. Yue; L. Zietsman
Senior Instructors: D. Agud; S. Anderson; T. A. Bourdon; S. Hagen; C. Hodges; A. Kohler; L. Powers; E. T. Shugart; C. Stephens
Advanced Instructors: M. P. McQuain
Instructors: M. Cothren; L. L. Hanks; H. Hart; L. Peters; B. Reynolds; J. Schmale; D.B. Smith
Career Advisor: Lizette Zietsman (231-2767)

Overview

Mathematics is essential to a clear and complete understanding of virtually all phenomena. The study of mathematics provides the ability to

describe applied problems quantitatively and to analyze these problems in a precise and logical manner. This is a principal reason behind the strong demand for mathematicians in government and industry. Essentially all complex problems, whether physical, social, or economic, are solved by designing a mathematical model, analyzing the model, and determining computational algorithms for an efficient and accurate approximation of a solution. Each of these phases is mathematical in nature. For example, if a problem deviates from a standard form, a mathematician should be able to adjust appropriately the usual mathematical treatment for the problem to accommodate for the deviation. In this case mathematical training provides a practical preparation for a career in today's changing world. Moreover, it is especially valuable since it is an education that equips one to continue to adapt to new situations.

Mathematicians typically are employed as applied mathematicians in their specialty areas. Our recent mathematics graduates have been approximately equally divided among government and industry, graduate school, and teaching. There are four different paths or options that a student may follow towards a B.S. in Mathematics: 1) the Traditional Option; 2) the Applied and Computational Mathematics Option (ACM); 3) the Applied Discrete Mathematics Option (ADM); and 4) the Mathematics Education Option (MAED).

The Traditional Option, as its name implies, yields a broad and flexible background in mathematics. The other three options are more specialized. The ACM is designed for students who are confident that they want to have an applied mathematics career in an area closely associated with physics or some form of engineering. The ADM is designed for students who plan to have an applied mathematics career in an area closely associated with computer science, statistics, or actuarial science. The Mathematics Education Option is designed for students who want to be certified to teach secondary mathematics.

Often students will begin their studies in the Traditional Option and later change to one of the other three options when they become more sure of the path they wish to pursue. One, however, can acquire many aspects of the three specialized options within the Traditional Option, because it also requires some degree of specialization in an applications area and provides career development features. The three specialized options are each less general, but bring particular career paths into sharper focus. Each of the four options provides an excellent foundation for graduate study, either in mathematics or in an applications area. Handbooks for each of the options, as well as mathematics career information, are available upon request.

Approximately $30,000 in Hatcher, Morris, Layman, Rollins, Steeneck, Caldwell, Wells, Oehring, Eckert and Roselle scholarships is awarded annually to mathematics majors at Virginia Tech: $13,000 for incoming freshmen and $17,000 for continuing undergraduates. Information on the scholarships is available from the scholarship chairman in mathematics.

The Cooperative Education Program is also available to qualified candidates, and students wishing to mix practical experience with their formal course studies are encouraged to investigate this option.

The mathematics department firmly believes that mathematics is not only useful and beautiful, but also fun. The department sponsors student chapters of MAA (Mathematical Association of America) and Pi Mu Epsilon (the national mathematics honorary society). As well as social activities, these groups sponsor speakers to talk on how mathematics is used in their work. Each fall, Virginia Tech also sponsors an Eastern U.S. Regional Mathematics competition. Each spring all freshmen and sophomores at Tech are invited to compete for prizes in a local mathematics contest. In addition, students (not all of whom are mathematics majors) annually receive organized preparation and compete in the nationwide William Lowell Putnam Competition. Individual undergraduate research projects are available to talented students, and a research prize is awarded. An overall outstanding senior, as well as an outstanding senior for each option, is recognized each year.

The Honors Program in Mathematics provides outstanding undergraduate majors the opportunity for an enriched academic environment. Through honors courses, an honors project, individual association with the faculty and honors advisors, and other perquisites, the honors student in mathematics enjoys a valuable advantage in the undergraduate experience. Moreover, in coordination with the head of Mathematics and the dean of Science, the honors student may design her/his own individual set of graduation requirements.

In addition to the four undergraduate-degree options, the department also offers the M.S. and Ph.D. Moreover, for qualified students, a combined program is available that leads to both a B.S. and an M.S. in mathematics. This program saves nearly a year from the usual time required for a B.S. and an M.S. done separately. Students in the Education Option obtain a B.S. in Math and an M.A. in Education by completing four years of undergraduate study and a fifth year in education for a full secondary certification.

The minor is designed to provide recognition for those students who take a program of study in mathematics above the normal requirements of their disciplines.

Bachelor of Science in Mathematics

Requirements:

The following is a sketch of the requirements for the four undergraduate options. For more details, obtain a handbook from the Department of Mathematics. All four options require 120 hours, satisfaction of the Curriculum for Liberal Education, and the following mathematics courses: 1114, 1205-1206, 1224, 2214, 2224, 3034, and 3224. Special requirements for each option are as follows:

a. **Traditional:** 3124, 3144, 3214, 12 hours 4000-level electives; computer programming, 16 hours of approved application-area courses.
b. **Education:** 3124, 4334, 4044, 4625, 4644, 4654, 4664, 6 hours 3/4000-level electives; STAT 4705, CS 1044; EDCI

3024, 3144, 3724, 4124, 4404, 4744, and 4754.

c. **ACM:** 3144, 3214, 4414, 4425-4426, 4445-4446, 6 hours 4000-level electives; CS 1044; 12 hours approved applied-area courses.
d. **ADM:** 3124, 3134, 3144, 3214, 4134, 4164, 6 hours 4000-level electives; CS 1044, 1705, 1706, 2204, 2605, 2606, 4104; STAT 4714.

Those courses listed in the catalog under the subtitles "Basic Sequences for Students Not in Engineering and Science Curricula" and "Electives for All Students Except Mathematics Majors" may not be used for graduation in mathematics. Special exceptions to this exclusion must have the approval of the head of the department of mathematics.

In order to enroll in 3034, a mathematics student must either (a) obtain a C or better in the final attempt of each of 1114, 1205, 1206, 1224, and (2224 or 2214); or (b) have at least a 2.2 GPA in these five courses with at most one grade of C- and no D's in the last attempt in each. Similarly, a student wishing to transfer into mathematics from another discipline must meet the same standards in these courses (or as far in these courses as she/he has progressed).

Each student is required to participate in the department's Outcomes Assessment procedures as determined by each year's Undergraduate Program Committee and approved by the department head.

Prospective Student Website

A great deal of further information on the Mathematics Program and on mathematical careers can be found on our website at www.math.vt.edu/

Minor in Mathematics

Requirements:

A total of 25 semester hours of mathematics courses as follows: Calculus (1205-1206, 1224, 2224); Linear Algebra & ODE's: (2214, 1114); and **one** course from either 3124, 3134, 3144, 3214, 3224, 4134, 4164, 4214, 4225, 4234, 4254, 4324, 4425, 4445, 4446 or 4514). The remaining hours are 3000- and 4000-level elective courses (except 2534 is allowed and 4044 is prohibited), and any 5000-level Mathematics course may be substituted in the above list. Duplications are prohibited. The student must have a 2.00 average in courses used for the minor, none of which may be taken pass/fail.

Advanced Placement

A student may obtain advanced-placement or advanced-standing credit from high school work for 1015, 1205, or 1206. The mathematics department strongly encourages calculus students to take the C.E.E.B. advanced-placement test in calculus.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the College of Science Core (see first part of this chapter), and toward the degree in mathematics.

Satisfactory progress toward the B.S. in mathematics requires that:

1. Within the previous two semesters, the student must pass at least one mathematics course which is used in the in-major GPA calculation.
2. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, course withdrawal), students must have completed:

MATH 1205-1206, 1224, 2224: Calculus	11
MATH 1114, 2214: Linear Algebra and ODE's	5
MATH 3034: Proofs and Algebraic Systems	3
Total Credits	**(19)**

3. Upon having attempted 96 semester credits, students must have an in-major grade-point average of 2.0 or above.

Undergraduate Courses (MATH)

- Basic Sequences for Students in Engineering, Building Construction, Chemistry, Computer Science, Geological Sciences, Mathematics, Physics, and Statistics
- Basic Sequences for Students in Agriculture, Architecture, Biology, Business, and Liberal Arts and Human Sciences

- Electives (may not be taken by Mathematics Majors)
- Electives (including Mathematics Majors)

Basic Sequences for Students in Engineering, Building Construction, Chemistry, Computer Science, Geological Sciences, Mathematics, Physics, and Statistics

1114: ELEMENTARY LINEAR ALGEBRA
Euclidean vectors, complex numbers, and topics in linear algebra including linear systems, matrices, determinants, eigenvalues, and bases in Euclidean space. This course, along with 1205-1206 and 1224, constitutes the freshman science and engineering mathematics courses. Partially duplicates 2524. 1525 may not be taken after taking 1114. 2 units of high school algebra, 1 unit of geometry, 1/2 unit each of trigonometry and precalculus required. (2H,2C)

1114H: ELEMENTARY LINEAR ALGEBRA
(2H,2C)

1205-1206: CALCULUS
Unified calculus course including techniques and applications of differentiation and integration of functions of a single variable. Limits, continuity, differentiation, integration, and transcendental functions. This sequence, together with 1114 and 1224, constitutes the first-year science and engineering mathematics courses. 1205 partially duplicates 1016 and 1526. 1206 partially duplicates 2015. Pre (for 1205): Either a grade of C or better in 1504, or 2 units of H.S. algebra, 1 unit of geometry, 1/2 unit each of trigonometry and precalculus, and placement by Math Dept. (3H,3C) 1205: I,II,III; 1206:

1205H-1206H: CALCULUS
(3H,3C)

1224: VECTOR GEOMETRY
Topics in analytic geometry and conic sections, and the calculus of vector-valued functions. This course, along with 1114 and 1205-1206, constitutes the freshman science and engineering mathematics courses. Pre: 1205. Co: 1206, 1114. (2H,2C) I,II,III,IV.

1224H: VECTOR GEOMETRY
(2H,2C)

2214: INTRODUCTION TO DIFFERENTIAL EQUATIONS
Unified course in ordinary differential equations. First-order equations, second- and higher-order linear equations, systems of first-order linear equations, and numerical methods. Partially duplicates 2514 and 4544. Pre: (1114 or 1114H), (1206 or 1206H or 2015). (3H,3C) I,II,III,IV.

2214H: INTRO DIFF EQUATIONS
Pre: (1114 or 1114H), (1206 or 1206H or 2015). (3H,3C)

2224: MULTIVARIABLE CALCULUS
Partial differentiation, multiple integration, and infinite series. Partially duplicates 2016. Pre: (1206 or 1206H or 2015), (1224 or 1224H). (3H,3C) I,II,III, IV.

2224H: MULTIVARIABLE CALCULUS
Pre: (1206 or 1206H or 2015), (1224 or 1224H). (3H,3C)

Basic Sequences for Students in Agriculture, Architecture, Biology, Business, and Liberal Arts and Human Sciences

1015-1016: ELEMENTARY CALCULUS WITH TRIGONOMETRY I
1015: College algebra, functions, exponentials and logarithms, matrices, sequences and series. 1016: Calculus including limits, derivatives, applications of derivatives, trigonometric functions. 1015 partially duplicates 1525. 1016 partially duplicates 1526 and 1205. 2 units of high school algebra and 1 of plane geometry required. (3H,3C) I,II,III,IV.

1525-1526: ELEMENTARY CALCULUS WITH MATRICES
1525: Modeling, linear, quadratic, exponential and logarithmic functions, limits, derivatives. 1526: Integration with applications, matrix algebra and solving systems of equations, multivariable calculus. Credit for 1525 precludes credit for 1016 or 1205. Credit for 1526 precludes credit for 1114. Credit for 2015 or 1206 precludes credit for 1526. Pre: 2 units of high school algebra and 1 unit of plane geometry required. (3H,3C)

1535,1536: GEOMETRY AND MATHEMATICS OF DESIGN
1535: Review of Euclidean geometry and trigonometry. Descriptive and projective geometry applied to drawing. Similarity, proportion, and the golden mean. Applications of graph theory. 1536: Calculus with applications to max/min, areas, volumes, and centroids. Polygons, patterns, and tilings of the plane. Polyhedra and vectors applied to 3-dimensional design. Pre: 2 units of high school algebra and 1 unit of high school geometry for each of 1535 and 1536. (3H,3C)

2015-2016: ELEMENTARY CALCULUS WITH TRIGONOMETRY II
Continuation of Math 1015-1016. 2015: Trigonometric calculus, indefinite integrals, definite integration, areas and volumes, multivariable differential calculus. 2016: Multiple integrals, indeterminate forms, infinite sequences and series, differential equations. 2015 partially duplicates 1206. 2016 partially duplicates 2224. Pre: 1016 for 2015; 2015 for 2016. (3H,3C) 2015: I,II,IV; 2016:

Electives (may not be taken by Mathematics Majors)

1614: NUMBER AND COMPUTING FOR TEACHERS
A study of the nature and structure of number, number theory, number systems, properties, operations and problem solving which are part of the foundation of the K-8 mathematics curriculum. Computer component includes an emphasis on using spreadsheets to construct mathematical models. I (4H,4C)

1624: GEOMETRY AND COMPUTING FOR TEACHERS
A study of key geometry concepts from multiple perspectives including transformational, coordinate, Euclidean and analytical geometry. Geometric and spatial reasoning are part of the foundation of the mathematical curriculum for grades K-8. Computer component integrates the Geometer's Sketchpad, Logo programming language, and other geometry based software. (4H,4C) II.

2514: ELEMENTARY DIFFERENTIAL EQUATIONS
Linear and nonlinear ordinary differential equations. Use of differential equations to model observed physical phenomena and experiments. Analytic and numerical solution methods. Graphical interpretation and slope fields. This course partially duplicates 2214 and 4544. Pre: 2015. (3H,3C)

2524: MATRICES, MODELING, AND LINEAR PROGRAMMING
An introductory course in mathematical modeling, matrix algebra, and linear programming. Includes the construction of several models to emphasize the diverse use of these topics in the study of other disciplines. Partially duplicates 1114. 1525 cannot be taken after 2524. Pre: 1205 or 1016 or 1526. (3H,3C)

2534: INTRODUCTION TO DISCRETE MATHEMATICS
Emphasis on topics relevant to computer science. Topics include logic, propositional calculus, set theory, relations, functions, mathematical induction, elementary number theory and Boolean algebra. Does not carry credit for mathematics majors, but may be used as though it were a 3000-level elective course for the mathematics minor. Partially duplicates 3034. Two units of high school algebra, one unit of geometry, one-half unit each of trigonometry and precalculus mathematics required. (3H,3C)

2624: ALGEBRA AND COMPUTING FOR TEACHERS
The beginning portions of the course are designed to provide, from an advanced standpoint, a comprehensive view of school algebra curricula. The remainder of the course is devoted to the investigation of algebraic relationships and algorithms through the use of the computer. Pre: 1624. (3H,3C)

4514: APPLIED ALGEBRA
Binary relations, groups, semigroups, monoids, rings, fields, Boolean algebras, and Polya's theory of Enumerations. Partially duplicates 3124. Pre: 1114, 1206. (3H,3C)

4525-4526: PRINCIPLES OF ADVANCED CALCULUS
4525: Elementary calculus review, real number system, continuity of single variable functions, integration, sequences and infinite series. 4526: Differential calculus of several variable functions, multiple integration, curves and surfaces, line and surface integrals. For non-mathematics majors: 4525 partially duplicates 3224, 4526 partially duplicates 3214. Pre: 2224 for 4525; 4525 for 4526. (3H,3C)

4544: ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
Ordinary differential equations: first order, second and higher order linear equations, power series and Laplace transform methods. Partial differential equations: Fourier series, separation of variables for heat, wave and potential equations. Sturm-Liouville theory. Bessel functions. Legendre polynomials. Partially duplicates 2214 and 4564. Pre: 1114, 1206. (5H,5C)

4554: NUMERICAL METHODS FOR ENGINEERS
Root-finding, interpolation, linear algebraic systems, numerical integration, and numerical solution of ordinary and partial differential equations. Duplicates 3414 and 4404, and can not be taken by mathematics majors. Computer programming required. Pre: 2214. (3H,3C)

4564: OPERATIONAL METHODS FOR ENGINEERS
Laplace transformations, Fourier series, partial differential equations and separation of variables, boundary value problems, and Sturm-Liouville theory. Duplicates 4544. Pre: 2214. (3H,3C) I,II,III,IV.

4574: VECTOR AND COMPLEX ANALYSIS FOR ENGINEERS
Vector Analysis: Green's theorem, potential theory, divergence, and Stokes' theorem. Complex Analysis: Analyticity, complex integration, Taylor series, residues, conformal mapping, applications. Pre: 2224. (3H,3C) I,II,III.

4584 (STAT 4584): ADVANCED CALCULUS FOR STATISTICS
Introduction to those topics in advanced calculus and linear algebra needed by statistics majors. Infinite sequences and series. Orthogonal matrices, projections, quadratic forms. Extrema of functions of several variables. Multiple integrals, including convolution and nonlinear coordinate changes. Pre: 1114, 1205, 1206, 2224. (3H,3C)

Electives (including Mathematics Majors)

1504: PRECALCULUS
College algebra, functions, exponential and logarithmic functions, trigonometry. This course is designed specifically to meet the needs of students who intend to be in a curriculum that requires 1205, but who are not yet ready to begin 1205. 1504 partially duplicates 1015 and 1525. 2 units of high school algebra and 1 unit of plane geometry required. (3H,3C) I,III.

2004 (ME 2004): ENGINEERING ANALYSIS USING NUMERICAL METHODS
Numerical methods applied to engineering analysis. Linear systems. Root finding. Numerical integration. Ordinary differential equations. Programming using a software package such as Matlab. Pre: ENGE 1016, MATH 1206, MATH 1114. (2H,2C)

2644: MATHEMATICS TUTORING
An introduction to mathematics tutoring. Course activities include the development of listening and questioning skills, assessment of a student's mathematical difficulties, and an exploration of teaching and learning processes. In a weekly journal, students will reflect on their tutoring experiences to develop and refine teaching goals and skills. A concurrent mathematics tutoring experience is required. Pre: 1206. (1H,1C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3034: INTRODUCTION TO PROOFS
Practice in writing mathematical proofs. Exercises from set theory, number theory, and functions. Specific topics include set operations, equivalence relations, mathematical induction, the division algorithm and images and pre-images of sets. Partially duplicates 2534 and 3434. In order to enroll in Math 3034, student must obtain (1) a C or better in each of 1114, 1205, 1206, 1224 and (either 2214 or 2224), or (2) at most one C- and a GPA of at least 2.2 in the courses mentioned in (1). (3H,3C) I,II,III.

3034H: HONORS INTRODUCTION TO PROOFS
(3H,3C)

3124: MODERN ALGEBRA
Introductory course in groups, rings and fields. This course partially duplicates 4514. Pre: 3034 or 3434. (3H,3C)

3134: APPLIED COMBINATORICS AND GRAPH THEORY
Emphasis on concepts related to computational theory and formal languages. Includes topics in graph theory such as paths, circuits, and trees. Topics from combinatorics such as permutations, generating functions, and recurrence relations. Pre: 1206, (2534 or 3034). (3H,3C) I,II,IV.

3144: LINEAR ALGEBRA I
Introductory course in linear algebra. Abstract vector spaces, linear transformations, algorithms for solving systems of linear equations, matrix analysis. Pre: 3034 or 3434. (3H,3C)

3214: CALCULUS OF SEVERAL VARIABLES
Fundamental calculus of functions of two or more variables. Implicit function theorem, Taylor expansion, line integrals, Green's theorem, surface integrals. Duplicates 4526. Pre: 2224. (3H,3C) II,IV.

3224: ADVANCED CALCULUS
Theory of limits, continuity, differentiation, integration, series. This course duplicates 4525. Course involves mathematical proofs; one may benefit by first taking 3034. Pre: 2224. (3H,3C) I,II,III.

3414 (CS 3414): NUMERICAL METHODS
Computational methods for numerical solution of non-linear equations, differential equations, approximations, iterations, methods of least squares, and other topics. Partially duplicates Math 4554. A grade of C or better required in CS prerequisite 1044 or 1705. Pre: 2214, 2224, CS 1044 or CS 1705. (3H,3C) II.

3434: INTRODUCTION TO DISCRETE APPLIED MATHEMATICS
Finite and infinite sets, mathematical induction, functions, equivalence relations, order relations, recurrence relations, discrete dynamical systems. Partially duplicates 2534 and 3034. In order to enroll in 3434, a student must obtain (1) a C or better in each of 1114, 1205, 1206, 1224 and (either 2214 or 2224), or (2) at most one C- and a GPA of at least 2.2 in the courses mentioned in (1). (3H,3C)

4024: AXIOMATIC SET THEORY
Peano postulates, cardinal arithmetic, axiom of choice, well orderings, ordinal arithmetic, continuum hypothesis. Pre: 2224, (3034 or 3134). (3H,3C)

4044: HISTORY OF MATHEMATICS
Historical development of mathematics from antiquity to modern times. Senior standing in mathematics required. (3H,3C) I.

4124: INTRODUCTION TO ABSTRACT ALGEBRA
An introduction to the theory of groups and rings. Topics include normal subgroups, permutation groups, Sylow's Theorem, Abelian groups, Integral Domains, Ideals, and Polynomial Rings. Pre: 3124. (3H,3C) I,II,III.

4134: NUMBER THEORY
Divisibility, congruences, multiplicative functions, primitive roots, quadratic reciprocity. Pre: 2534 or 3034 or 3134. (3H,3C) II.

4144: LINEAR ALGEBRA II
Second course in linear algebra. Similarity invariants, Jordan canonical form, inner product spaces, self-adjoint operators, selected applications. Pre: 3144. (3H,3C)

4164: ADVANCED DISCRETE MATHEMATICS
Advanced topics in discrete mathematics with applications. Includes counting techniques, generating functions, recurrence relations, combinatorial designs, semigroups, words and rewriting rules, matroids, and selected additional topics (e.g., Ramsey theory, Polya theory, Young tableaux). Knowledge of a programming language (e.g., C, fortran, Pascal) required. I Pre: 3034, 3134. (3H,3C)

4175-4176: CRYPTOGRAPHY
4175: Elementary concepts in cryptography; classical cryptosystems; modern symmetric cryptography; public key cryptography; digital signatures, authentication schemes; modular arithmetic, primitive roots, primality testing. At least one mathematics course at or above the 3000 level and facility with either a programming language or a computer algebra system is required. 4176: Discrete logs; pseudoprime tests; Pollard rho factoring; groups; quadratic residues; elliptic curve cryptosystems and factoring; coding theory; quantum cryptography. (3H,3C)

4214: LINEAR ANALYSIS
Linear algebra of infinite dimensional spaces, inner product spaces, normed spaces, completeness, orthonormal bases, bounded and unbounded linear operators, adjoints, spectra, compact operators. Pre: (3214 or 4526), (3224 or 4525), (4425 or 4564). (3H,3C)

4225-4226: ELEMENTARY REAL ANALYSIS
Real number system, point set theory, limits, continuity, differentiation, integration, infinite series, sequences and series of functions. Pre: 3224 for 4225; 4225 for 4226. (3H,3C) I,II.

4234: ELEMENTARY COMPLEX ANALYSIS
Analytic functions, complex integration, series representation of analytic functions, residues, conformal mapping, applications Pre: 4525 or 3224. (3H,3C) II.

4245-4246: INTERMEDIATE DIFFERENTIAL EQUATIONS
Solution techniques, linear systems, the matrix exponential, existence theorems, stability, non-linear systems, eigenvalue problems. Pre: 3224 or 4525. (3H,3C)

4254: CHAOS AND DYNAMICAL SYSTEMS
Survey of basic concepts in chaotic dynamical systems. Includes material on bifurcation theory, conjugacy, stability, and symbolic dynamics. Pre: 3224 or 4525. (3H,3C)

4324: ELEMENTARY TOPOLOGY
Basic concepts of topological spaces, continuous functions, connected spaces, compact spaces, and metric spaces. I Pre: 3124, 3224. (3H,3C)

4334: COLLEGE GEOMETRY
Transformational approach to Euclidean geometry including an in-depth study of isometries and their application to symmetry, geometric constructions, congruence, coordinate geometry, and non-Euclidean geometries. Pre: 1114, 1206. (3H,3C) I,II.

4344: TOPICS IN GEOMETRY
Selected topics in geometry for advanced undergraduates. Pre: 1114, 1206.
(3H,3C)

4404 (AOE 4404): APPLIED NUMERICAL METHODS
Interpolation and approximation, numerical integration, solution of equations, matrices and eigenvalues, systems of equations, approximate solution of ordinary and partial differential equations. Applications to physical problems. Partially duplicates 4554 and 3414. Mathematics majors or minors cannot take both 4404 and 3414. Pre: 4564, ESM 2074. (3H,3C)

4414 (CS 4414): ISSUES IN SCIENTIFIC COMPUTING
Theory and techniques of modern computational mathematics, computing environments, computational linear algebra, optimization, approximation, parameter identification, finite difference and finite element methods and symbolic computation. Project-oriented course; modeling and analysis of physical systems using state-of-the-art software and packaged subroutines. Pre: 2214, 3214. (2H,3L,3C)

4425-4426: FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS
Separation of variables for heat, wave, and potential equations. Fourier expressions. Application to boundary value problems. Bessel functions. Integral transforms and problems on unbounded domains. 4425: I, II. 4426: II. Pre: (2214, 2224), (3224 or 4525) for 4425; (2214, 2224), (3224 or 4525), 4425 for 44 26. (3H,3C)

4445,4446: INTRODUCTION TO NUMERICAL ANALYSIS
4445: Vector spaces and review of linear algebra, direct and iterative solutions of linear systems of equations, numerical solutions to the algebraic eigenvalue problem, solutions of general non-linear equations and systems of equations. 4446: Interpolation and approximation, numerical integration and differentiation, numerical solutions of ordinary differential equations. Computer programming skills required. Pre: 2214, 2224. (3H,3C) 4445: I,III; 4446:

4454: APPLIED MATHEMATICAL MODELING
Analysis of classical and modern applications of mathematics in the physical, biological and social sciences. Emphasis on problem formulating, modeling, solving, simulating, and analyzing results. Programming language required. (3H,3C)

4625,4626: MATHEMATICS FOR SECONDARY TEACHERS
Course activities will emphasize the curricular themes of problem solving, reasoning and proof, communication, connections, and representation.

4625: Topics in discrete mathematics and algebra from a secondary teaching perspective. 4626: Topics in trigonometry, geometry, measurement, statistics, and probability from a secondary teaching perspective. Pre: 3034. (3H,3C)

4644: SECONDARY SCHOOL MATHEMATICS WITH TECHNOLOGY
Use and impact of technology in secondary mathematics curriculum. Various technologies including graphing calculators, calculator based laboratory and probes (CBLs), computer algebra systems, spreadsheets, dynamic geometry software and the Internet will be used to explore secondary mathematical concepts from an advanced viewpoint. Pre: 3034. (3H,3C) I.

4654: CAPSTONE THESIS AND SEMINAR
Students will review and discuss current research, state and national policies, and curriculum materials and trends in secondary mathematics education. Students will apply research findings and policy initiatives to the development of a major project in which they write and present unified plans for the teaching of a particular mathematical topic. Admission to the Graduate School and instructor approval required. Pre: 3034, EDCI 3724. (1H,1C)

4664: SENIOR MATH EDUCATION SEMINAR
A review of basic principles and problem-solving techniques in the eleven topics covered by the Praxis II (Mathematics Content Knowledge) examination. Passing the Praxis II examination prior to student teaching is a state requirement for all students seeking secondary licensure. Passing Praxis I required. Pre: 3124.
(2H,2C)

4754: INTERNSHIP
May be repeated for a maximum of 12 credits. Pass/Fail only. Variable credit course.

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

TOP

College of Science

Physics

www.phys.vt.edu/

University Exemplary Department
Beate Schmittmann, Chair
Professors: M. Blecher; L. N. Chang[1]; J.R. Heflin; L. E. Piilonen; M. L. Pitt; R. Raghavan; B. Schmittmann; J. Slawny; U. Tauber; R. B. Vogelaar; R. K. P. Zia
Associate Professors: N. Arav; J. J. Heremans; G. Khodaparast; D. Minic; T. Mizutani; M. J. F. Pleimling; A. L. Ritter; J. H. Simonetti; V. Soghomonian; T. Takeuchi
Assistant Professors: P. Huber; R. Kulkarni; J. M. Link; K. Park; H. Robinson; V. W. Scarola; E.R. Sharpe
Adjunct Professors: R. Blankenbecler; C. D. Bowman; B. L. Bressler; Z. Chang; V. H. Gehman, Jr.; Y. Liang; Z. Toroczkai
Career Advisor: A. L. Ritter (231-5369)
Affiliated Faculty: L. Asryan[2]; S. Eukank[3]; L. Guido[4]; A. Onufriev[5]; M. Paul[6]
[1]Dean of the College of Science
[2]Regular appointment with Material Science and Engineering
[3]Regular appointment with the Virginia Bioinformatics Institute
[4]Regular appointment with Materials Science & Engineering and Electrical & Computer Engineering
[5]Regular appointment with Computer Science
[6]Regular appointment with Mechanical Engineering

Overview

The physics curriculum is designed to provide a broad foundation in the physical sciences, as well as specialized training in classical and modern physics, and it may lead to either a B.S. or a B.A. An honors student may also qualify for a five-year program leading to both the B.S. and M.S. Experimental opportunities are available in such fields as fundamental particle physics, nuclear physics, condensed matter physics, laser optics, radio astronomy, and multimedia teaching demonstrations. Superior students are encouraged to participate with faculty members in undergraduate research projects. Computers are available for use by all physics majors.

Liberal emphases in the physics curriculum permit students to give special attention to those aspects of the discipline they prefer and enable them either to pursue a traditional course of study as preparation for joining the technical staffs of industries or government laboratories, or for graduate studies in physics (B.S.); or to pursue an interdisciplinary course of study with a strong background in physics (B.A.).

A handbook that includes sample curricula for emphases in astrophysics, chemistry, computer science, education, electrical engineering, finance; geophysics, materials science, and mathematics is available from the department on request.

The requirements for the B.S. are, in addition to the college curriculum and the Curriculum for Liberal Education: Phys 2305, 2306, 3304 (or 3455 and 3504), 3314, 3355, 3356, 3405, 3406, 3704, (or 4504 or 4554), 4315, 4316, 4455, 4456; Math 1114, 1205, 1206, 1224, 2214, 2224, 2984 (Linear Algebra-2 cr.), 4564 (or 4425), and Chem 1035, 1036, 1045, 1046. Outstanding students may also elect to complete the requirements for a B.S. "in honors." A description of this honors program in physics is included in the handbook indicated above. The requirements for the B.A. are, in addition to the college curriculum and the Curriculum for Liberal Education: Phys 2305, 2306, 3304, 3314, 3355, 3356 (or 3405), 3655 (or 3656), 3704, 4315; Math 1114, 1205, 1206, 1224, 2214, 2224; 14 specific credits of Biology or Chemistry or Geology; and Hist 3705, 3706. The department also offers the M.S. and Ph.D. in physics (see the Graduate Catalog).

Transfer students should contact the department early, preferably one full semester prior to entrance. This procedure will allow a thorough evaluation of transfer credits and correct placement.

A student may obtain a minor in physics by registering with the department and successfully completing 2305, 2306, (or 2175, 2176, and two physics laboratory credits), 3304, 3355 (or 3405), 3704, plus three more physics credits at or above the 3000 level.

A minor in astronomy is also available and may be obtained by registering with the department and successfully completing 1055, 1056, 1155, 1156, 3154, 3655, 3656, and one more course from an approved list (see J. H. Simonetti).

The department participates in the Cooperative Education Program in which a student may alternate through two successive years a semester of study with a semester of professional employment in his/her discipline; these two years normally replace the student's sophomore year. Additional information on the program is included in the "Academics" chapter in this catalog and in the handbook indicated above.

Any student who completes for credit Physics 2004 or 2014 while having already passed (with a grade of D or better in the A-F option or P in the P/F option) Physics 2175, 2205, or 2305, will have such credit in 2004 or 2014 converted to "audit" before his/her graduation.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the College of Science Core (see first part of this chapter), and toward the degree in physics.

Satisfactory progress toward the degree in physics requires that:

1. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed:

B.S. in Physics

Chem 1035, 1036: General Chemistry	6
Chem 1045, 1046: General Chemistry Lab	2
ENGL 1105, 1106: Freshman English	6
MATH 1114: Elementary Linear Algebra	2
MATH 1205, 1206: Calculus	6
MATH 1224: Vector Geometry	2
MATH 2214: Intro. to Differential Equations	3
MATH 2224: Multivariable Calculus	3
PHYS 2305, 2306: Foundations of Physics I	8
Total Credits	**38**

B.A in Physics

ENGL 1105, 1106: Freshman English	6
MATH 1114: Elementary Linear Algebra	2
MATH 1205, 1206: Calculus	6
MATH 1224: Vector Geometry	2
MATH 2214: Intro. to Differential Equations	3
MATH 2224: Multivariable Calculus	3
PHYS 2305, 2306: Foundations of Physics I	8
Total Credits	**30**

Upon having attempted 96 semester credits, students must have an in-major grade point average of 2.0 or above and for the B.S. in Physics must have completed:

PHYS 3304: Foundations of Physics II (or 3455 and 3504)	4 (7)
PHYS 3314: Intermediate Laboratory	3
PHYS 3355, 3356: Intermediate Mechanics	6
PHYS 3405, 3406: Intermed. Elec. and Magnetism	6
Total Credits	**57-60**

Undergraduate Courses (PHYS)

1054: A BRIEF HISTORY OF THE UNIVERSE
Overview of the universe, evolutionary development of the universe beginning with the Big Bang through structure formation and galaxy formation, star formation and stellar life cycles, planet formation, the planetary system, and life in the universe. Prior credit for Phys 1056 or Phys 2054 precludes credit for 1054. (3H,3C) I,II.

1055-1056: INTRODUCTION TO ASTRONOMY
Apparent sky motions, telescopes, properties of the planets, structure and organization of the solar system, stars, star formation, stellar evolution, organization of the Milky Way Galaxy, galaxies, quasars, structure and evolution of the universe, and cosmological models. Prior credit for Phys 2044 precludes credit for 1055. Prior credit for Phys 1054 or Phys 2054 precludes credit for 1056. (3H,3C) I,II.

1155-1156: ASTRONOMY LABORATORY
Simulation of apparent sky motions; observations of planets, stars, and nebulae with quantitative analysis; long term observations of sky changes; analysis of images; laboratory experiments of astrophysical relevance. Co: 1055 for 1155; 1056 for 1156. (3L,1C) I,II.

2074: HIGHLIGHTS OF CONTEMPORARY PHYSICS
Conceptual overview of fundamental modern thinking in physics. Presents the key ideas and philosophical/ethical aspects of the most important developments in modern physics, such as quantum mechanics, relativity, particle physics, cosmology, etc., and discusses their impact on our understanding of the universe and our position in it. I (3H,3C)

2205-2206: GENERAL PHYSICS
For students in curricula other than physical sciences, mathematics, or engineering, who have not studied calculus. 2205: Mechanics, optics, acoustics. 2206: Electromagnetism, thermodynamics, relativity, and topics in modern physics. Pre: MATH 1016 or MATH 1016H or MATH 2015 or MATH 1205H or MATH 1525 or MATH 1535 for 2205; 2305 or 2205 for 2206. (3H,3C) I,II.

2215-2216: GENERAL PHYSICS LABORATORY
Lab experiments dealing with basic laws and techniques of physics; designed to illustrate covered in General Physics, 2205-2206. Should be taken concurrently and in phase with lecture sequence, 2205-2206. I Co: 2205 for 2215; 2206 for 2216. (3L,1C)

2305-2306: FOUNDATIONS OF PHYSICS I
First two semesters of the three-semester introductory sequence for students in physical sciences and mathematics. Includes classical mechanics, gravity, and waves (2305); heat, electricity, magnetism and optics (2306); laboratory work. 3304 is the concluding semester of the sequence. Pre: MATH 1205 or MATH 1205H or MATH 1206 or MATH 1206H for 2305; (MATH 1206 or MATH 1206H), PHYS 2305 for 2306.
Co: MATH 1206, 2325 for 2305. (3H,3L,4C) I,II.

2325-2326: SEMINAR FOR PHYSICS MAJORS
Introduction to the field of physics and to the Physics Department. Overview of modern physics topics such as special relativity, quantum mechanics, condensed matter, nuclear, and particle physics. Presentation of research activities in the department. Also provides more in-depth discussion of and math preparation for topics in 2305-2306. For physics majors. Co: 2305 for 2325; 2306 for 2326. (1H,1C)

2504: MATH METHODS IN PHYSICS
Applications of mathematical methods to physics. Topics include spatial coordinate systems, linear algebra techniques in coupled motions, series approximations of solutions to physical systems, extremum problems in physics, differential equations in mechanics, integration in two and three spatial dimensions, probability theory in thermal physics. Pre: 2305. Co: MATH 2214, MATH 2224, 2306. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3154: OBSERVATIONAL ASTROPHYSICS
Telescopic observations of the moon, planets, stars, interstellar medium, and galaxies; astrophotography; digital imaging. Telescopes; virtual observing techniques and instruments; photographic and digital imaging systems. Astronomical data reduction and interpretation; digital image processing. Prior credit for Phys 2154 precludes credit for 3154. Pre: 1156. (1H,3L,2C) II.

3314: INTERMEDIATE LABORATORY
Characteristics of common instrumentation and basic circuits, methods of producing good practices in data gathering, recording, and analysis. (2H,3L,3C) II.

3324: MODERN PHYSICS
Photons and their interactions with matter, wave-particle duality, Heisenberg uncertainty principle, Schrodinger's equation of motion, hydrogenic and multi-electron atoms, Pauli exclusion principle, molecules, solids, nuclei, elementary particles. Includes lab work. MATH 4544 can be substituted for

co-requisite MATH 2214. Pre: 2306, 2504, CHEM 1035. Co: MATH 2214. (3H,3L,4C)

3355-3356: INTERMEDIATE MECHANICS
Formal aspects of classical mechanics and dynamics. Topics include Newtonian, Lagrangian and Hamiltonian theory applied to non-relativistic systems in one, two, and three dimensions, relativistic dynamics, linear algebra applied to coupled many-body motion, small oscillations, and rigid body motion. Pre: MATH 1224, MATH 2214, PHYS 2305, PHYS 2306 for 3355; 3355 for 3356. (3H,3C)

3405-3406: INTERMEDIATE ELECTRICITY AND MAGNETISM
Electrostatics, multipoles, Laplace's equation, and dielectric media. Magnetostatics, magnetic media, and electromagnetic induction. Maxwell's equations, electromagnetic energy, waves, and radiation. Must meet pre-requisites and have a grade of C or better in each of 2305-2306 sequence. Pre: MATH 2214, PHYS 2305, PHYS 2306 for 3405; MATH 2214, PHYS 2305, PHYS 2306, PHYS 3405 for 3406. (3H,3C) I,II.

3655,3656: INTRO ASTROPHYSICS
Application of elementary physical laws to determine dimensions, masses, luminosities, structures, and evolution of astronomical objects and the universe as a whole. Emphasis is on quantitative derivation. Pre: 2306. (3H,3C) I,II.

3704: THERMAL PHYSICS
Introduction to the concepts, formalism, and applications of classical and quantum statistical mechanics, including thermodynamics. Pre: 2306. Co: MATH 2214, 3455. (3H,3C) II.

4315-4316: MODERN EXPERIMENTAL PHYSICS
Representative apparatus, techniques, and phenomena of contemporary research. Includes electrical measurements, computers, thermometry, vacuum deposition, machine shop, nuclear spectra, experimentation related to major developments of modern physics. Pre: 3314 for 4315; 3314, 4315 for 4316. (6L,2C) I,II.

4455-4456: INTRODUCTION TO QUANTUM MECHANICS
Experimental bases; postulates; conservation theorems and symmetry; one-dimensional and two-dimensional problems; angular momentum and problems in three dimensions; matrix mechanics and spin; applications to atomic and molecular physics; perturbation theory; scattering. Pre: 3356, 3406 for 4455; 3356, 3406, 4455 for 4456. (3H,3C) I,II.

4504: INTRODUCTION TO NUCLEAR AND PARTICLE PHYSICS
Structure and properties of atomic nuclei and elementary particles, theoretical interpretations based on elementary quantum mechanics. Symmetries; various nuclear models; interactions at small distances; classification of elementary particles. Consent required. Co: 4456. (3H,3C) II.

4554: INTRODUCTION TO SOLID STATE PHYSICS
Basic concepts of solid state physics including crystal structure, lattice vibrations, electron states, energy bands, semiconductors, metals. Consent required. Co: 4456. (3H,3C) II.

4574: NANOTECHNOLOGY
Introduction to methods of controlling matter on the nanometer length scale and the applications thereof. Nanolithography, self-assembly, and scanned probe microscopy; nanomaterials including fullereness, carbon nanotubes, and quantum dots; nanoscale and molecular electronics; nanoelectromechanical systems; nanoscale optoelectronics; and nanobiotechnology. Pre: 2205, 2206 or 2305, 2306. (3H,3C)

4614: OPTICS
Fundamentals of the ray, wave and quantum models of light, and topics in modern optics with contemporary applications. I Pre: 2306, MATH 2214, MATH 2224. (3H,3C)

4624: OPTICS LABORATORY
Laboratory experiments dealing with ray and wave optical phenomena designed to illustrate and complement the principles covered in OPTICS Phys 4614. Physics majors are required to take 4624 concurrently with the lecture course 4614. I Co: 4614. (3L,1C)

4674: INTRODUCTION TO GENERAL RELATIVITY
Introduction to methods and applications of Einstein's general theory of relativity. Space and time and gravity in Newtonian physics; special theory of relativity, gravity as geometry of curved space-time; black holes; cosmology; Einstein's gravitational field equations; gravitational waves and relativistic stars. Pre: 2305, 2306, MATH 2214 or MATH 2514. (3H,3C)

4714: INTRODUCTION TO BIOPHYSICS
Selected topics from the general area of biomechanics, bioelectricity, radiation biophysics, molecular biophysics, and thermodynamics and transport in biological systems. Emphasis on the physical aspects of biological phenomena and biophysical measurement techniques and instrumentation. I Pre: 2206 or 2306. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

College of Science

Psychology

www.psyc.vt.edu/

University Exemplary Department
Robert S. Stephens, Chair
University Distinguished Professor: T. H. Ollendick
Alumni Distinguished Professor: E. S. Geller
Heilig-Meyers Professor: R. A. Winett
Professors: G. A. Clum; K. Deater-Deckard; J. W. Finney; R. T. Jones
Associate Professors: D. K. Axsom; M.A. Bell; R. J. Foti; B. H. Friedman; J. Germana; D. W. Harrison; R. J. Harvey; N. M. A. Hauenstein; R. K. Pannenton; A. Scarpa
Assistant Professors: J. C. Dunsmore; M. S. Fritz; J. Kim; S. W. White
Clinical Associate Professor: L. D. Cooper
Advanced Instructor: K. A. Hoffman
Affiliated Faculty: D. L. Brinberg; B. V. Corsino; W. D. Crews; R. H. Crouse; S. B. Gustafson; A. D. Hamilton; B. Klein; C. A. Lease; R. E. Lickliter; R. S. Schulman; T. Smith-Jackson; D. R. Southard; D. G. Tatar; J. B. Weaver; R. C. Williges
Career Advisor: Cindy Koziol (231-5388)

Overview

The Department of Psychology offers an undergraduate program leading to the B.S. To graduate with a major in psychology, the undergraduate student must complete the core curriculum requirements of the College of Science and the following departmental requirements:

A minimum of 28 hours of psychology including Psyc 2004, 2044, 2094, and three 4000-level courses, at least one with laboratory (Psyc 4964, 4974, and 4994 are not counted as 4000-level courses for purposes of this requirement). At least 21 semester hours must be in courses other than Psyc 2964, 2974, 2994, 4964, 4974, or 4994.

Successful completion of at least **one** of the following statistics courses:

STAT 2004: Introductory Statistics
STAT 3005 or 3006: Statistical Methods
STAT 3604: Statistics for the Social Sciences
STAT 3615 or 3616: Biological Statistics

In addition to courses used to fulfill the Scientific Reasoning and Discovery requirement (Area 4) of the College of Science Core Curriculum, two courses (6 semester hours) in one of the following areas: biology, chemistry, physics. These additional courses need not be in the same discipline as courses used to satisfy Area 4 of the College of Science Core.

Successful completion of two courses (6 semester hours) from the disciplines of computer science, philosophy, and/or statistics. These courses may either be in the same discipline or from any two of the three disciplines. Courses used to satisfy College of Science Core requirements or other Psychology department requirements may not also be used to satisfy this requirement.

To graduate with a minor in psychology, the undergraduate student must complete 18 hours of psychology including Psyc 2004, 2094, and one 4000-level course (Psyc 2964 and 4964 may not be used toward the psychology minor).

A program leading to the B.S. in psychology "in honors" is available for eligible students. Additionally, opportunities are provided for students to engage in a directed program of independent research. The department sponsors a chapter of Psi Chi, the national psychology honor society, and the Psychology Club. A Cooperative Education Program is available in which a student may alternate a semester of study with a semester of employment. Additional information on this program is provided in the "Academics" chapter of this catalog. Information about

these and other activities is available at the Academic Advising Center Office (109 Williams Hall) which is located in the Department of Psychology.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see Academics chapter in this catalog), toward the College of Science Core (see above), and toward the degree in psychology.

Satisfactory progress toward the B.S. in psychology requires that:

1. Upon having attempted **30 semester hours** (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have an **overall GPA of 2.00** and must have completed the following course:

   Psyc 2004: Introduction to Psychology

2. Upon having attempted **72 semester hours**, students must have an **overall GPA of 2.0** and have completed the following courses:

   Psyc 2094: Principles of Psychological Research
   STAT 3604 or a statistics course approved to fulfill the psychology department requirement
   One additional three credit psychology course

3. Upon having attempted **92 semester hours**, students retain an **in-major GPA of 2.00 or above.**

Undergraduate Courses (PSYC)

2004: INTRODUCTORY PSYCHOLOGY
The scientific study of behavior, behavioral research methods and analysis, and theoretical interpretations. Survey of basic behavioral processes from sensory and physiological mechanisms to personality types and complex decision-making in humans. An Honors Section of this course may be offered. Requires enrollment in 1 hour (0 credit) recitation. (3H,3C)

2034: DEVELOPMENTAL PSYCHOLOGY
Basic principles of human psychological development from the prenatal period through old age are examined. Surveys recent literature within the areas of perceptual, cognitive, and social/emotional development. Pre: 2004. (3H,3C)

2044: PSYCHOLOGY OF LEARNING
Survey of fundamental concepts, phenomena, and principles of learning, such as reinforcement, Pavlovian conditioning and retention/forgetting. Issues addressed are traditional views of learning, biological and cognitive constraints, the role of animal models, and the utility of learning theory. Pre: 2004. (3H,3C)

2054: PSYCHOLOGY OF PERSONALITY
Study of human personality and psychological adjustment: theory and research. Behavioral, cognitive, humanistic, and environmental determinants of personality. Psychological adjustment and personality development. Pre: 2004. (3H,3C)

2064: NERVOUS SYSTEMS & BEHAVIOR
Introduction to the workings of the nervous system and the relation between those workings and behavior. Special emphasis on human nervous systems and behavior. Pre: 2004. (3H,3C)

2074: ANIMAL BEHAVIOR
Study of animal behavior: Comparative psychology and ethology, behavioral genetics, evolution of behavior, ecological aspects of behavior, predation, reproduction, and parental care. Some consideration is given to the relevance of animal behavior to human behavior. Pre: 2004. (3H,3C)

2084: SOCIAL PSYCHOLOGY
Introduction to the social behavior of the individual and the group: social perception, attribution theory, attitude formation and change, interpersonal attraction, aggression and conflict, group dynamics, applied social psychology. Pre: 2004. (3H,3C)

2094: PRINCIPLES OF PSYCHOLOGICAL RESEARCH
Research design and methodology. Analysis of a variety of approaches to developing, understanding, and interpreting psychological data. Pre: 2004. (3H,3C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course. X-grade allowed.

2974: INDEPENDENT STUDY
Variable credit course.

2984: SPECIAL STUDY
Variable credit course.

2994: UNDERGRADUATE RESEARCH
Variable credit course.

3014: ABNORMAL PSYCHOLOGY
Survey of various types of psychological disorders and of contrasting theoretical views and representative research on the etiology and prognosis of these disorders. Emphasis on diagnosis and classification of disorders. Pre: 2004. (3H,3C)

3024: ENVIRONMENTAL PSYCHOLOGY
Survey of the effects of the environment on humans, and vice versa. Topics include crowding, noise, air, and water pollution and their effects on behavior. Research and theories about person-environment relations. Pre: 2004. (3H,3C)

3034: PSYCHOLOGICAL DISORDERS OF CHILDREN
An examination of theory, research, and practice as related to the assessment, treatment, and prevention of psychological disorders of children. Special emphasis on the understanding of child behavior disorders from a developmental, clinical-experimental point of view. Pre: 2004, 3014. (3H,3C)

3044: BEHAVIOR MODIFICATION
Major principles and techniques available to modify behavior, particularly pathological behavior. Emphasis placed on environmental manipulations which serve to modify behavior. Pre: 2004, 2044, 3014. (3H,3C)

3054: HEALTH PSYCHOLOGY
Major theories, strategies, and methods for understanding psychological contributions to health and disease; psychological approaches to the treatment and prevention of disease and unintentional injuries, and health and safety promotion. Pre: 2004. (3H,3C)

3154 (EDCI 3154): PSYCHOLOGICAL FOUNDATIONS OF EDUCATION
Emphasizes theories of human learning and the relationship of learning principles to educational practice. Within the context of both cognitive and behavioral models of learning, attention is given to instructional procedures, student motivation and discipline, and the assessment of educational progress. Pre: 2004. (3H,3C)

4014: HISTORY AND SYSTEMS IN PSYCHOLOGY
Overview of modern theories in psychology by consideration of current historical controversies. Traces roots of psychology in natural and social sciences. Considers the diversity of psychological study and the future of psychology. Senior standing in psychology required for undergraduate credit. Graduate standing required for graduate credit. (3H,3C)

4024: INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY
Overview of psychological theories, research findings, and methods relevant to studying the behavior of individuals in organizations. Topics covered may include prediction of job performance, personnel testing, training and development, and leadership. Pre: 2004, (STAT 2004 or BIT 2405 or STAT 3604). (3H,3C)

4034: ADVANCED DEVELOPMENTAL PSYCHOLOGY
Development of attention, cognition, social skills, language, personality, and intelligence throughout the life-span: an in-depth, critical evaluation of current research and theory. Pre: 2004, 2034. (3H,3C)

4044: ADVANCED LEARNING
Critical analysis of basic paradigms of Pavlovian and Instrumental Conditioning with emphasis on general theories of learning and issues involved in cognition, reinforcement, and memory. Pre: 2004, 2044, 2094. (3H,3C)

4054: PERSONALITY RESEARCH
Research techniques used in contemporary personality psychology: case histories, correlational methods, experimentation, archival studies, and psychobiography. Pre: 2004, 2054, (STAT 2004 or STAT 3604 or BIT 2405). (3H,3C)

4064: PHYSIOLOGICAL PSYCHOLOGY
Presentation of concepts important for the study of neuroscience and behavior with a special emphasis on the classic topics of physiological psychology: brain-behavior relations, sensory integration, physiological correlates of motivation and emotion. Pre: 2004, 2064, 2094. (3H,3C)

4074: SENSATION AND PERCEPTION
Overview of sensory and perceptual systems and their integration in influencing behavior. Emphasis on sensory receptor characteristics, neural structure, psychophysical data, perceptual phenomena and issues, theories about the human perceptual process. Pre: 2004, 2064, 2094. (3H,3C)

4084: ADVANCED SOCIAL PSYCHOLOGY
Examines social behavior from four major theoretical orientations: reinforcement, field theory, cognitive, and role theory. Topics may include social learning, social exchange theories, group processes, attitude, and person perception. Pre: 2004, 2084. (3H,3C)

4094: THEORY OF PSYCHOLOGICAL MEASUREMENT
Theory of psychological measurement and techniques used to develop and evaluate psychological measures. Coverage of standardization, measurement scales, reliability, validity, score transformations, composite scores, weighted scores, and test construction. Pre: 2004, 2094, (STAT 2004 or STAT 3604 or BIT 2405). (3H,3C)

4104: MOTIVATION

Overview of concepts, phenomena, principles, and theories of motivation from biological, learning, social and cognitive viewpoints. Pre: 2004, 2044, 2094. (3H,3C)

4114: COGNITIVE PSYCHOLOGY
An experimentally-oriented survey of human cognitive processes which include attention, memory, and decision making. Role of individual difference variables in each area. Pre: 2004, 2044, 2094. (3H,3C)

4124 (EDCI 4124): PSYCHOLOGICAL FOUNDATIONS OF EDUCATION FOR PRESERVICE TEACHERS
Emphasizes applying human learning and developmental theories to the classroom setting with a focus on instructional processes and procedures, student motivation, classroom management, and assessment strategies. Participation in a 4-year or 5-year teacher education program. Junior level standing. Pre: 2004 or HD 1004. (3H,3C)

4174 (EDCI 4174): STUDENTS WITH EMOTIONAL AND BEHAVIORAL DISORDERS
This course examines the characteristics and needs of individuals with emotional and behavioral disorders. Topics include history, definitions and causes of emotional and behavioral disorders, major research findings, identification procedures, educational programming and current issues. (2H,2C)

4204: LABORATORY IN MOTIVATION
Experimental techniques for studying motivation in humans and animals including deprivation procedures, expectancy manipulations, verbal instructions, incentive variables, care and maintenance of animals, and techniques for measuring frequency, latency, and magnitudes of responding. Co: 4104. (3L,1C)

4214: COGNITIVE PSYCHOLOGY LABORATORY
Design, operation, and analysis of experiments to study human cognitive processes (e.g., attention, memory, and decision-making). Co: 4114. (3L,1C)

4234: LABORATORY IN DEVELOPMENTAL PSYCHOLOGY
Research design and implementation in the study of perceptual and motor development, language development, cognitive development, and social development. Pre: 2004, 2034. Co: 4034. (3L,1C)

4244: LABORATORY IN ADVANCED LEARNING
Experimental techniques for studying the development, maintenance, and retention of behavior change in humans and animals. Laboratory exercises in Pavlovian and Instrumental Conditioning, verbal learning and memory. Co: 4044. (3L,1C)

4254: PERSONALITY RESEARCH LABORATORY
Laboratory course in personality research techniques. Emphasis on experimental, archival, questionnaire, and psychobiographical approaches. Co: 4054. (3L,1C)

4264: LABORATORY IN PHYSIOLOGICAL PSYCHOLOGY
Experimental techniques in the area of physiological psychology including: handling and care of laboratory animals, anesthetic and surgical techniques, and measurement of physiological variables. Co: 4064. (3L,1C)

4274: LABORATORY IN SENSATION AND PERCEPTION
Overview of the major experimental techniques and phenomena of sensation and perception. Emphasis on psychophysical methods, signal detection, dark adaptation, perceptual illusions. Co: 4074. (3L,1C)

4284: LABORATORY IN SOCIAL PSYCHOLOGY
Design, performance, and analysis of experiments in social psychology. Various methodologies used in social research (e.g., laboratory experimentation, field observations) will be studied through actual performance of experiments. Co: 4084. (3L,1C)

4294: LABORATORY IN PSYCHOLOGICAL MEASUREMENT
Design and implementation of psychological assessment devices including issues of test construction, reliability, validity, standardizing, and detecting test bias. Pre: 2004, 2094, (STAT 2004 or STAT 3604 or STAT 2405). Co: 4094. (3L,1C)

4354: SENIOR SEMINAR
For Psyc majors. Intended to provide in-depth coverage and discussion of a small set of topics selected by members of the seminar. Consent required. (3H,3C)

4364: SENIOR SEMINAR
For Psyc majors. Intended to provide in-depth coverage and discussion of a small set of topics selected by members of the seminar. (3H,3C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course. X-grade allowed.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

College of Science

Statistics

www.stat.vt.edu

E. P. Smith, Head
Professors: J. B. Birch; I. Hoeschele; J.P. Morgan; M. R. Reynolds, Jr.[1]; E. P. Smith; G.G. Vining; W.H. Woodall
Associate Professors: G. I. Holtzman; G. R. Terrell
Assistant Professors: P. Du; F. Guo; L. House; D. Kim; I. Kim; S. Leman
Lecturer: L. M. Harrell; M. Lemons
[1]Joint with Forestry

Overview

Statistics courses are offered at both the undergraduate and the graduate levels for students preparing for professions in statistics, for students who need statistical tools to engage in scientific research, and for students who want to acquire knowledge of the important concepts of probability and statistical inference.

Statistics courses for graduate students and programs leading to the M.S. and Ph.D. degrees in statistics are described in the Graduate Catalog and in a special bulletin available from the department.

Bachelor of Science in Statistics

The Statistics major requires the completion of 35 credit hours in Statistics, 16 hours of Mathematics, 3 hours of Computer Science and 3 hours of Technical Writing. Specific requirements can be found on the department website.

All statistics majors are required to own specified personal computers and software. Consult the department for details.

A special brochure describing the department and the B.S. program, intended for prospective entering freshmen, is available from the department upon request.

Cooperative Education and Internship positions are available in industry and government, offering valuable practical experience. Students participating in such an experience can receive academic credit which will count towards graduation requirements.

Minor in Statistics

Requirements: 18 hours

1. Completion of an introductory sequence: 3005-3006, 3615-3616 or 4705-4706;
2. 4204;
3. 6-9 credit hours from 3504, 4004, 4214, 4444, 4504, 4514, 4524, 4534, 4804 or ISE 4404.
4. 3 hours may come from 2004, 3604, 4604, 4714, providing it is the first statistics course taken.

The department reserves the right to withhold credit if a student takes a course, the content of which is partially duplicated in a course already taken (see *Course Duplications* below).

Laboratory for Interdisciplinary Statistical Analysis (LISA)

Associated with the statistics department, the Laboratory for Interdisciplinary Statistical Analysis (LISA) provides statistical assistance for research projects throughout the university community. Faculty members, staff, and students are available to aid in statistical design and analysis for any authorized research study here at the university and at other state agencies.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the Curriculum for Liberal Education (see "Academics"), toward the College of Science Core (see first part of this chapter), and toward the degree in statistics. Satisfactory progress toward the B.S. in Statistics requires that:

Upon having attempted 70 semester credits (including transfer, advanced placement, advanced standing, credit by examination, freshman rule), students must have completed *with a course grade of C- or above:*

1. Upon having attempted 72 semester credits (including transfer, AP, advanced standing, credit by examination, course withdrawal) majors must have completed the following courses with grades of C- or better: STAT 3005, 3006; MATH 1205, 1206, 1114, 1224, 2224, and not have taken any MATH or STAT designated course for the degree more than twice, including attempts ending in course withdrawal.
2. Upon having attempted 90 semester credits, students must have an in-major grade point average of 2.0 or above.

Course Duplications

No credit will be given for 2004 if taken with or after any other statistics course; MASC 1034, STAT 3604 if taken with or after any statistics course except 2004, 3104. BIT 2405 may not be used as a substitute for credit as a statistics course unless the student was officially registered as a Business major at the time. BIT 2405 was taken. Exceptions to the duplications involving courses approved for the minor in statistics may be granted for students who are obtaining a minor in statistics, provided that the requirements listed under Minor in Statistics have been met.

Computer Literacy

Many statistics courses involve the use of statistics software; primarily MINITAB or SAS. Experience with the software is not expected, but students should have familiarity with either the Windows or Macintosh operating system and have access to a computer. These courses are identified by "WIN/MAC" under prerequisites.

Course Projects

Many of the upper-division course descriptions include the word 'Project.' Those courses will usually include a major term project, either individually or in small groups. These projects are designed to give students the kind of insight and experience in realistic statistical practice that cannot be obtained in classroom lectures or short-term homework assignments.

Undergraduate Courses (STAT)

2004: INTRODUCTORY STATISTICS
Fundamental concepts and methods of statistics with emphasis on interpretation of statistical arguments. An introduction to design of experiments, data analysis, correlation and regression, concepts of probability theory, sampling errors, confidence intervals, and hypothesis tests. (See also Course Duplications). Pre: MATH 1015. (4H,3C) I,II,III.

2954: INTRODUCTION TO DATA MANAGEMENT AND SAS
Introduction to computer workstations, Unix command language, common desktop environment. Computer networking concepts. Data management and presentation in the Statistical Analysis System (SAS), including data input, data manipulation, graphs, macros. Co: 3005. (1H,2L,2C)

2964: FIELD STUDY
Pass/Fail only. Variable credit course.

3005-3006: STATISTICAL METHODS
3005: Basic statistical methodology: exploratory data techniques, estimation, inference, comparative analysis by parametric, nonparametric, and robust procedures. Analysis of variance (one-way), multiple comparisons, and categorical data. 3006: Analysis of variance, simple and multiple, linear and nonlinear regression, analysis of covariance. Use of MINITAB. WIN/MAC. Pre: MATH 1206 for 3005; 3005 for 3006. (3H,3C) 3005: I,II,III; 3006:

3094: SAS PROGRAMMING
Introduction to basic programming techniques: creating DATA and PROC statements, libraries, functions, programming syntax and formats. Other topics include loops, SAS Macros, and PROC IML. Emphasis is placed on using these tools for statistical analyses. The prerequisite may be substituted for an equivalent course. Pre: 3005. (3H,3C)

3104: PROBABILITY AND DISTRIBUTIONS
Probability theory, including set theoretic and combinatorial concepts; in-depth treatment of discrete random variables and distributions, with some introduction to continuous random variables; introduction to estimation and hypothesis testing. Pre: MATH 1206 or MATH 2015 or MATH 1526. (3H,3C) I,II.

3504: NONPARAMETRIC STATISTICS
Statistical methodology based on ranks, empirical distributions, and runs. One and two sample tests, ANOVA, correlation, goodness of fit, and rank regression, R-estimates and confidence intervals. Comparisons with classical parametric methods. Emphasis on assumptions and interpretation. WIN/MAC, even years. I. Pre: 3006, 4106, 4604, 4706. (3H,3C)

3604: STATISTICS FOR THE SOCIAL SCIENCES
Statistical methods for nominal, ordinal, and interval levels of measurement. Topics include descriptive statistics, elements of probability, discrete and continuous distributions, one and two sample tests, measures of association. Emphasis on comparison of methods and interpretations at different measurement levels. (See also Course Duplications). Pre: MATH 1015. (3H,3C) I,II,IV.

3615-3616: BIOLOGICAL STATISTICS
Descriptive and inferential statistics in a biological context. 3615: Fundamental principles, one- and two-sample parametric inference, simple linear regression, frequency data. 3616: One- and two-way ANOVA, multiple regression, correlation, nonparametrics, using the MINITAB computer package. (3H,3C) 3615: I,II,III; 3616:

3704: STATISTICS FOR ENGINEERING APPLICATIONS
Introduction to statistical methodology with emphasis on engineering experimentation: probability distributions, estimation, hypothesis testing, regression, and analysis of variance. Only one of the courses 3704, 4604, 4705, and 4714 may be taken for credit. Pre: MATH 2224. (2H,2C) I,II.

4004: METHODS OF STATISTICAL COMPUTING
Computationally intensive computer methods used in statistical analyses. Statistical univariate and multivariate graphics; resampling methods including bootstrap estimation and hypothesis testing and simulations; classification and regression trees; scatterplot smoothing and splines. Pre: (4105, 4214). (4H,3C)

4024: COMMUNICATION SKILLS FOR STATISTICAL CONSULTING
Specialized tools for design and analysis applicable to current interdisciplinary statistical consulting projects. Oral and written communication skills important to effective client-statistician interactions, including interview, report-writing, and oral presentation skills. Pre: 3006, 4204. (2H,2C)

4105-4106: THEORETICAL STATISTICS
4105: Probability theory, counting techniques, conditional probability; random variables, moments; moment generating functions; multivariate distributions; transformations of random variables; order statistics. 4106: Convergence of sequences of random variables; central limit theorem; methods of estimation; hypothesis testing; linear models; analysis of variance. I Pre: MATH 2224. (3H,3C)

4204: EXPERIMENTAL DESIGNS
Fundamental principles of designing and analyzing experiments with application to problems in various subject matter areas. Discussion of completely randomized, randomized complete block, and Latin square designs, analysis of covariance, split--plot designs, factorial and fractional designs, incomplete block designs. Project. Knowledge of WIN/MAC required. I Pre: 3006 or 3616 or 4106 or 4706 or 5605 or 5615. (3H,3C)

4214: METHODS OF REGRESSION ANALYSIS
Multiple regression including variable selection procedures; detection and effects of multicollinearity; identification and effects of influential observations; residual analysis; use of transformations. Non-linear regression, the use of indicator variables, and logistic regression. Use of SAS. Project. Knowledge of WIN/MAC required. I Pre: 3006 or 3616 or 4106 or 4706 or 5606 or 5616. (3H,3C)

4444: APPLIED BAYESIAN STATISTICS
Introduction to Bayesian methodology with emphasis on applied statistical problems: data displaying, prior distribution elicitation, posterior analysis, models for proportions, means and regression. Pre: MATH 2224. (3H,3C)

4504: APPLIED MULTIVARIATE ANALYSIS
Non-mathematical study of multivariate analysis. Multivariate analogs of univariate test and estimation procedures. Simultaneous inference procedures. Multivariate analysis of variance, repeated measures, inference for dispersion and association parameters, principal components analysis, discriminant analysis, cluster analysis. Use of SAS. Project. Knowledge of WIN/MAC required, even years. Pre: 3006 or 4706 or 5606 or 5616. (3H,3C) II.

4514: CONTINGENCY TABLE ANALYSIS
Statistical techniques for frequency data. Goodness-of-fit. Tests and measures of association for two-way tables. Log-linear models for multidimensional tables. Parameter estimation, model selection, incomplete tables, ordinal categories, logistic regression. Use of SAS and SPSSx. Project. Knowledge of WIN/MAC required, even years. II. Pre: 3006 or 3616 or 4106 or 4706 or 5606 or 5616. (3H,3C)

4524: SAMPLE SURVEY METHODS
Statistical methods for the design and analysis of survey sampling. Fundamental survey designs. Methods of randomization specific to various survey designs. Estimation of population means, proportions, totals, variances, and mean squared errors. Design of questionnaires and organization of a survey. Project. Odd years. I Pre: 3006 or 3616 or 4106 or 4706 or 5606 or 5616. (3H,3C)

4534: APPLIED STATISTICAL TIME SERIES ANALYSIS
An applied course in time series analysis. A uniform coverage of both time domain and frequency domain methods that are used in the physical,

biological, and social sciences and by applied statisticians. WIN/MAC. Odd years. Pre: (3006 or 4106 or 4706 or 4714 or 5606 or 5616), (MATH 1206). (3H,3C) II.

4584 (MATH 4584): ADVANCED CALCULUS FOR STATISTICS
Introduction to those topics in advanced calculus and linear algebra needed by statistics majors. Infinite sequences and series. Orthogonal matrices, projections, quadratic forms. Extrema of functions of several variables. Multiple integrals, including convolution and nonlinear coordinate changes. Pre: MATH 1114, MATH 1205, MATH 1206, MATH 2224. (3H,3C)

4604: STATISTICAL METHODS FOR ENGINEERS
Introduction to statistical methodology with emphasis on engineering applications: probability distributions, estimation, hypothesis testing, regression, analysis of variance, quality control. Only one of the courses 3704, 4604, 4705, and 4714 may be taken for credit. Knowledge of WIN required. I, II. Pre: MATH 1206. (3H,3C)

4705-4706: PROBABILITY AND STATISTICS FOR ENGINEERS
Basic concepts of probability and statistics with emphasis on engineering applications. 4705: Probability, random variables, sampling distributions, estimation, hypothesis testing, simple linear regression correlation, one-way analysis of variance. 4706: Multiple regression, analysis of variance, factorial and fractional experiments. Only one of the courses 3704, 4604, 4705, and 4714 may be taken for credit. Knowledge of WIN/MAC required. I, II, III. Pre: MATH 2224 for 4705; 4705 or 4105 for 4706. (3H,3C)

4714: PROBABILITY AND STATISTICS FOR ELECTRICAL ENGINEERS
Introduction to the concepts of probability, random variables, estimation, hypothesis testing, regression, and analysis of variance with emphasis on application in electrical engineering. Only one of the courses 3704, 4604, 4705, and 4714 may be taken for credit. I, II, III. Pre: MATH 2224. (3H,3C)

4724: STATISTICAL THEORY FOR ECONOMISTS
Probability, random variables, marginal and conditional distributions, mathematical expectations, sampling distributions, properties of estimators, maximum likelihood and least squares estimation, confidence intervals, hypothesis tests, linear regression. Emphasis on preparation for graduate study in econometrics. I Pre: 3006, MATH 2015. (3H,3C)

4804 (AAEC 4804): ELEMENTARY ECONOMETRICS
Economic applications of mathematical and statistical techniques: regression, estimators, hypothesis testing, lagged variables, discrete variables, violations of assumptions, simultaneous equations. Pre: (3005 or 3604), (AAEC 1006). (3H,3C) II.

4954: PROFESSIONAL PORTFOLIO
Preparation of a portfolio of professional quality statistical reports, using the student's term reports from three upper division applied statistics courses. Student will choose a faculty mentor to work with in preparation of the portfolio. Statistics major with Senior standing. Pass/Fail only. I, II, III, IV. Pass/Fail only. (1H,1C)

4964: FIELD STUDY
Pass/Fail only. Variable credit course.

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

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College of Veterinary Medicine

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Gerhardt G. Schurig, Dean
Associate Dean for Professional Programs: Dr. Jennifer L. Hodgson
Associate Dean for Research and Graduate Studies: Roger J. Avery
Assistant Dean for Administration: J. Michael Harness
Assistant Dean for Strategic Innovations: Ludeman A. Eng

Professors: S. A. Ahmed; R. J. Avery; D. L. Barber; S. M. Boyle; V. A. Buechner-Maxwell; M. V. Crisman; M. F. Ehrich; F.C. Elvinger; G. B. Daniel; M. O. Furr; D. R. Hodgson; K. D. Inzana; T. J. Inzana; B. S. Jortner; M. M. Larson; J. C. Lee; M. S. Leib; D. S. Lindsay; L. J. McCutcheon; R. A. Martin; J. B. Meldrum; X. J. Meng; W. E. Monroe; D. L. Panciera; J. P. Pickett; B. J. Purswell; R. L. Pyle; J. L. Robertson; G. G. Schurig; S. A. Smith; D. P. Sponenberg; N. Sriranganathan; K. E. Sullins; G. C. Troy; N. A. White, II; W. D. Whittier; J. R. Wilcke
Associate Professors: J. Abbott; D. J. Blodgett; T. Caceci; J. J. Dascanio; L. A. Eng; L. E. Freeman; I. P. Herring; J. L. Hodgson; W. R. Huckle; J. C. Jones; B. G. Klein; O. I. Lanz; H. C. McKenzie, III; D. M. Moore; K. D. Pelzer; L. G. O'Rourke; F. W. Pierson; R. S. Pleasant; P. C. Roberts; J.H. Rossmeisl; G. K. Saunders; W. K. Scarratt; B. J. Smith; Y. Suzuki; W. S. Swecker, Jr.; S. G. Witonsky; A. M. Zajac
Assistant Professors: J.G. Barrett; D. Caudell; L.A. Dahlgren; D.C. Grant; T.A.M. Harper; P.N. Henao-Guerrero; T. Kaur; Y.W. Lee; T. LeRoith; C. Ricco; E. Subbiah; A.R. Tyson; L. Yuan; K. Zimmerman
Research Associate Professor: W. Eyestone
Research Assistant Professors: A.B.P.A. Bandara; S.M. Werre
Clinical Associate Professors: M.N. Adams; J. F. Currin; B.J. Pierce
Clinical Assistant Professors: M.N. Adams; I.K. Becvarova; J. A. Brown; A. M. Desrochers; S. Diaz; C. Hatfield; S.A. Dukti; L.G. Kleine; D. Reeder; J.M. Settlage; A. A. Smith; N. Weinstein
Clinical Instructors: O. Becvar
Adjunct Faculty: S. B. Barker; J.Bassaganya-Riera; M. J. Bowen; R.C. Brown; K. A. Duca; T. P. Caruso; B. M. Dunham; J. M. Erwin; R. Evans; M. R. Finkler; E. J. Gentz; R.J. Geor; J. M. Gregg; A. W. Hayes; K. P. High; T. Hrubec; L. Hungerford; S. R. Jenkins; V. Kok; L. J. Kyle; D. LaFlamme; T.J. Leighton; L. Li; Y. Li; J. McGhee; J. McRuer; G. G. Meza; J. Palmieri; B. D. Perry; S. Peterson; S. L. Porter; M.R. Prater; C. Reilly; B. Rzigalinski; S. Samal; A. Santo; S. Schwartz; W. Sims; S. Singh; J. Sleeman; J. M. Shuler; W. B. Spillman; S. J. Stahl; E. Stephenson; J. S. Strobl; M. L. Tilghman; L. Tobias; M. E. Torrence; C. A. Williams; D. Wolf

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Overview

Founded by the Virginia General Assembly in 1978, the Virginia-Maryland Regional College of Veterinary Medicine is a regional school for the professional training of veterinarians which has been built upon the strong foundations of two of the nation's leading land-grant universities: Virginia Tech in Blacksburg and the University of Maryland at College Park. The College operates three campuses, including the main campus facilities at Virginia Tech, the Avrum Gudelsky Veterinary Center at College Park, and the Marion duPont Scott Equine Medical Center in Leesburg.

Graduate Programs

The graduate program leads to the M.S. and Ph.D. in biomedical and veterinary sciences. The goal of this program is to enhance the research capabilities of the graduates so that they can conduct independent research and associated societal endeavors aimed at solving biomedical problems related to veterinary medicine. These individuals will be expected to make scientific contributions in academia, research, and animal health administration.

For additional information, contact the Graduate School via e-mail vmsgrad@vt.edu.

The Professional Program

Students desiring admission to the four-year instructional program leading to the D.V.M. degree must show evidence of intellectual ability and achievement, as well as personal preparation for the curriculum and the profession. Because the number of applicants greatly exceeds the number of spaces in entering classes, only those who demonstrate such qualifications to a high degree will be selected. Most entering students will have completed three or more years at an accredited university by the time of matriculation; however, applications will be accepted from students who have completed at least 60 semester hours or 90 quarter hours of university credit by the end of the spring term of the year for which application is being made, and who have a grade point average of at least 2.8 on a four-point scale. Exceptional students with the minimum university course work are encouraged to apply.

A number of college courses, with laboratory classes, are required for entry into the DVM program including biological sciences, organic chemistry, and physics. An 8-semester-hour or 12-quarter-hour sequence is required for each of these subjects. A one-semester course (3 s. h.) in biochemistry will meet the minimum requirement for entry.

Further courses required include 6 semester hours or 9 quarter hours of college-level courses in English, mathematics, and humanities/social sciences. In addition, many courses contributing to a well-rounded liberal education are of direct value and, although proficiency in the sciences is essential to the understanding of veterinary medicine, concentration on the sciences at the undergraduate level is not essential. Those students who elect to major in disciplines other than the biological sciences, chemistry, or physics may find less difficulty in coping with the basic sciences in veterinary medical school if they have, in addition to the above mentioned required courses, some work in either advanced biology or advanced chemistry. Suggested electives include: biostatistics; cell biology, comparative anatomy, genetics, microbiology, nutrition, physiology, or domestic animal production courses. Since veterinary medicine also is concerned with a variety of social, environmental, and community activities, a broad cultural background as well as a technical education is required. Basic computer skills are highly desirable.

Admissions inquiries should be directed to the individuals listed below:

Jacque Pelzer, D.V.M.
Director of Admissions and Student Services
Virginia-Maryland Regional College of Veterinary Medicine

Ms. Joyce D. Massie
Admissions Coordinator

Admissions Office
Virginia-Maryland Regional College of Veterinary Medicine
Virginia Tech, Blacksburg, VA 24061
540/231-4699
E-mail: dvmadmit@vt.edu
Website: www.vetmed.vt.edu

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Professional Program Courses

Professional program courses leading to the D.V.M. degree carry the veterinary medicine (VM) prefix.

8004: Professional Foundations In Veterinary Medicine
8014 (BMVS 5434): Veterinary Anatomy I
8024: Descriptive Embryology
8034 (BMVS 5454): Veterinary Physiology I
8044: Medical Biochemistry
8054: Veterinary Histology
8064 (BMVS 5044): Veterinary Immunology
8074: Large Animal Husbandry
8084: Veterinary Epidemiology
8094: Clinical Perspectives
8104 (BMVS 5474): Veterinary Neurobiology
8114 (BMVS 5444): Veterinary Anatomy II
8124 (BMVS 5054): Veterinary Virology
8134 (BMVS 5464): Veterinary Physiology II
8144: Veterinary Ethology
8244: Morphology Of Wild Mammals
8234: Fundamentals Of Nutrition
8254 (BMVS 5814): Functional Morphology Birds, Reptiles
8264 (BMVS 5824): Small Animal Nutrition
8274: Topics In Veterinary Pharmacology
8284: Veterinary Musculoskeletal System
8864: Effective Communication in Veterinary Practice
8874: Ferret Medicine & Surgery
8984: Special Study
9004: Avian Medicine And Surgery
9014: Advanced Diagnostic Imaging
9034: Advanced Small Animal Surgery
9044: Food Animal Clinical Problem Solving
9054: Food Safety for Veterinarians
9064: Advanced Histopathology
9074: Goat And Sheep Medicine
9085-9086 (BMVS 5005-5006): Emerging Infectious Diseases
9094 (BMVS 6564): Advanced Veterinary Public Health
9095-9096 (BMVS 5305-5306): Veterinary Oncology
9104: Business Management
9114: Toxicology of Poisonous Plants Affecting Livestock
9124: Advanced Equine Theriogenology
9134: Advanced Small Animal Surgery Lab
9144: Problem Solving In Small Animal Medicine
9174: Equine Neonatology & Pediatrics
9184: Advanced Cardiovascular Medicine
9204 (BMVS 4084): Medical Toxicology

8304: Veterinary Pathology I
8314 (BMVS 5244): Fundamentals Of Veterinary Pharmacology
8324 (BMVS 5744): Veterinary Parasitology
8334 (BMVS 5754): Veterinary Bacteriology & Mycology
8344: Veterinary Opthalmology
8354: Veterinary Clinical Techniques
8374: Fundamentals of Theriogenology
8384 (BMVS 5834): Food Animal Nutrition
8394 (BMVS 5844): Equine Nutrition
8404: Veterinary Pathology II
8414 (BMVS 5734): Clinical Pathology
8424 (BMVS 5254): Veterinary Toxicology
8434: Veterinary PUBLIC HEALTH
8444: Veterinary Anesthesiology
8454: Veterinary Clinical Nutrition
8474: Reproductive Pathology
8485-8486-8487: Bovine Reproductive Management
8494 (BMVS 5764): Aquatic Medicine/Fish Health
8514 (BMVS 6514): Equine Theriogenology
8524: Equine Clinical Problem Solving
8534 (BMVS 5564): Introduction To Clinical Research
8544: Veterinary Radiology
8554: General Veterinary Medicine
8574: Food Animal Theriogenology
8585, 8586, 8587: Small Animal Medicine
8594: Wildlife Medicine
8614: Veterinary Gastroenterology
8615, 8616: Food Animal Medicine And Surgery
8624: Veterinary Surgical Principles and Practicals
8644: Urology
8654: Veterinary Neurology
8674: Veterinary Hemolymphatic System
8684 (BMVS 6554): Advanced Epidemiology
8686: Introduction To Clinics
8694: Advanced Small Animal Techniques
8695, 8696: Equine Medicine And Surgery
8754 (BMVS 5864): Veterinary Cardiorespiratory System
8764: Veterinary Dermatology and Endocrinology
8784: Clinical Pharmacology
8804: Complementary Medicine
8854: Veterinary Career Development

9214 (BMVS 6574): Animals and Public Policy
9224: Clinical Applications In Exotic Animal Medicine
9234 (BMVS 6584): Veterinary Public Policy
9244 (BMVS 6594): International Veterinary Medicine
9254: Small Animal Theriogenology
9264: Small Animal Community Practice Clerkship
9404: Specialty Medicine Clerkship
9424: Avian Medicine Elective Clerkship
9434: Small Animal Medicine Clerkship
9454: Veterinary Ophthalmology Elective Clerkship
9464: Radiology (Ultrasound) Elective Clerkship
9504: Large Animal Clinical Services Clerkship
9534: Production Management Medicine Clerkship
9544: Equine Medical Center Clerkship
9554: Lge Animal Clin. Services Elective Clerkship
9564: Food Animal Elective Clerkship
9574: Production Mgt Medicine Elective Clerkship
9584: Small Animal Theriogenology Clerkship
9594: Theriogenology Elective Clerkship
9604: Sm. Ruminant/Pseudoruminant Elec. Clerkship
9614: Small Animal Surgery Clerkship
9624: Anesthesiology Clerkship
9634: Radiology Clerkship
9644: Small Animal Private Practice Clerkship
9654: Small Animal Internal Med. Elective Clerkship
9664: Small Animal Surgery Elective Clerkship
9674: Small Animal Spec. Practice Elective Clerkship
9684: Small Animal Emergency Med. Elective Clerkship
9694: Anesthesiology Elective Clerkship
9704: Clinical Pathology Clerkship
9714: Govt & Corp. Veterinary Medicine Clerkship
9724: Laboratory Services Clerkship
9744: Morphologic Pathology Elective Clerkship
9764: Independent Study Elective Clerkship
9774: Self-Initiated Elective Clerkship
9784: Govt & Corp. Vet. Med. Elective Clerkship
9794: Ctr. For Govt. And Corp. Vet. Medicine Clerkship
9804: Food Animal Private Practice Clerkship
9814: Equine Private Practice Clerkship
9824: Mixed Species Private Practice Clerkship
9834: Equine Theriogenology Clerkship
9844: Food Animal Theriogenology Clerkship

TOP

Undergraduate Courses (BMVS)

4014: ANIMAL DOMESTICATION AND GENETIC RESOURCES
Considers the process, history, sociology and geography of animal domestication. Includes behavioral, physiologic and morphological changes incurred by domesticated stocks. Examines genetic variability of domestic species, considersbreed groups and uniquely adapted breeds. Considers reasons for erosion of genetic variability and mechanisms to counteract such erosion. International in scope. Pre: senior status or enrollment in veterinary professional curriculum. I (1H,1C)

4024: DISEASES OF POULTRY
Biology control and prevention of poultry diseases. Taught alternate years. I (2H,2C)

4034 (BCHM 4034): ENVIRONMENTAL HEALTH TOXICOLOGY
Health effects associated with the exposure to chemicals, identifying and managing problems of chemical exposure in the work places and the environment, fundamental principles of biopharmaceutics and toxicokinetics, and risk assessment. Emphasis on conceptual understanding of chemical entry into the body, biotransformation, or degradation multiple chemical sensitivity,and chemically induced diseases. Identification of nutrient interactions with environmentally induced disorders and to understand the mechanisms of such interactions and their influence on human health and welfare. Pre: BIOL 2104 or BIOL 3124, ALS 2304 or BIOL 2406 or BCHM 3114. (3H,3C)

4054: LABORATORY ANIMAL MANAGEMENT
This course involves a study of the principles of laboratory animal science, providing the student with a basic understanding of the laws and regulations governing the care and use of animals, husbandry and surgery of a variety of lab animal species, and variables which can adversely affect animal research. Through formal lectures, discussions, and laboratory sessions, the course is designed to complement graduate studies in biological, biomedical, and life sciences which involve the use of animals in research. (2H,3L,3C)

4064: INTRODUCTION TO MEDICAL PHYSIOLOGY
An introductory course to the principles of medical physiology, designed primarily for -- but not limited to -- undergraduate and graduate students majoring in biomedical engineering, and other related engineering and physical sciences majors with little or no formal background in biological sciences. The focus is on basic principles and concepts of physiology with a special emphasis on the interactions of human systems biology in their entirety rather than individual genes and pathways. Not intended for students expecting to major in biology or planning to enter health professional fields. Pre: Junior standing or permission of the instructor. (3H,3C)

4074: PHARMACOLOGY
A basic course in the science of pharmacology, intended to provide an understanding of the mechanisms of action and physiological systemic effects of major classes of drugs of biological, agricultural, social, and medical importance. Must have prerequisites or equivalent. Pre: CHEM 2514 or CHEM 2535 or ALS 2304 or BIOL 2406. (3H,3C)

4084 (VM 9204): MEDICAL TOXICOLOGY
Adverse health effects of exposure to drugs or substances of abuse. Covers principles of toxicodynamics, toxicokinetics, biotransformation, diagnosis and treatment. Emphasis will be placed on mechanism(s) of action of the various drug classes, body system(s) affected, clinical manifestations of problems and the resulting adverse effects on human health and society. Methods of treatment and client education will also be addressed. Laws controlling and governing the use of these drugs/substances and the agencies responsible for them will also be covered. Pre: third year standing in DVM curriculum. Pre: (CHEM 2514 or CHEM 2535), (BIOL 2406 or ALS 2304), (MATH 1015). (2H,2C)

4094: VERTEBRATE DEVELOPMENT
A comprehensive exposition of developmental events and anatomy in vertebrates, with emphasis on mammals. Clinical correlations with congenital illness and malformations are stressed. Intended to give students in the life sciences a background in the organization of anatomy and extensive understanding of the processes of ontogeny. Appropriate for majors in Biology, Animal Science, pre-medical, pre-veterinary, and other pre-professional programs. Spring alternate years. Pre: Permission of the instructors. (3H,3L,4C)

4104: TOPICS IN PHARMACOLOGY
Designed for senior undergraduates and graduate students desiring in-depth study of selected topics in pharmacology - tailored to individual students' careers, e.g. research, government service, academia. Essay/seminar format provides opportunity to develop oral and written communication skills. Pre: Pharmacology I: 4074 (3 credits) or equivalent. Pre: 4074. (3H,3C)

4974: INDEPENDENT STUDY
Variable credit course.

4984: SPECIAL STUDY
Variable credit course.

4994: UNDERGRADUATE RESEARCH
Variable credit course.

Undergraduate Courses (BMSP)

2135-2136: HUMAN ANATOMY & PHYSIOLOGY
Structure and function of the human body for students preparing for professions in the health fields. 2135: body plan and organization, homeostasis, cell structure and function, histology, integumentary system, skeletal system, muscular system, nervous system, special senses, and endocrine system. 2136: cardiovascular system, lymphatic system and immunity, respiratory system, digestive system, metabolism, excretion, reproduction, and development.BMSP 2135-2136 duplicates BIOL 2405-2406, may not receive credit for both. Pre: (BIOL 1005 or BIOL 1006) or (BIOL 1105 or BIOL 1106) for 2135; (BIOL 1005, BIOL 1006) or (BIOL 1105, BIOL 1106) or (BIOL 1005, BIOL 1106) or (BIOL 1105, BIOL 1006), BMSP 2135 for 2136. (3H,3C)

2145-2146: HUMAN ANATOMY AND PHYSIOLOGY LABORATORY
Laboratory exercises investigating the structure and function of the human body for students preparing for professions in the health fields. 2145: body plan and organization, homeostasis, cell structure and function, histology, integumentary system, skeletal system, muscular system, nervous system, special senses, and endoctrine system. 2146: cardiovascular system, lymphatic system and immunity, respiratory system, digestive system, metabolism, excretion, reproduction, and development. BMSP 2145-2146 duplicates BIOL 2414, may not receive credit for both. Co: 2135 for 2145; 2136 for 2146. (3L,1C)

Governance, Administration and Faculty

BOARD OF VISITORS

OFFICERS

John R. Lawson, II, Rector
George Nolen, Vice Rector
Kim O'Rourke, Secretary

MEMBERS
(Appointed by the Governor to terms expiring on dates indicated)

ex officio: **Paul W. Rogers, Jr.**
Michael Anzilotti (2003-11)
Frederick J. Cobb (2008-12)
Beverley Dalton (2004-12)
Ben J. Davenport, Jr. (2002-10)
Michele L. Duke (2005-13)
Douglas R. Fahl (2008-12)
Calvin D. Jamison, Sr. (2008-12)
John R. Lawson, II (2002-10)
Sandra Stiner Lowe (2003-11)
George Nolen (2005-13)
James W. Severt, Sr. (2003-11)
James R. Smith (2006-10)
Lori L. Wagner (2006-10)

ADMINISTRATIVE OFFICERS

Charles W. Steger
President
Mark G. McNamee
Senior Vice President and Provost
Raymond D. Smoot
University Treasurer; Chief Operating Officer of the Virginia Tech Foundation
Earving L. Blythe
Vice President for Information Technology and Chief Information Officer
James R. Bohland
Vice President and Executive Director of National Capital Region Operations
John E. Dooley
Vice President for Outreach and International Affairs
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Vice President and Dean for Undergraduate Education
Edward Spencer
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Robert Walters
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Sherwood Wilson
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Richard Benson
Dean, College of Engineering
Lay Nam Chang
Dean, College of Science
A. Jack Davis
Dean, College of Architecture and Urban Studies
Karen P. DePauw
Vice President and Dean for Graduate Education
Eileen E. Hitchingham
Dean, University Libraries
Paul Winistorfer
Dean, College of Natural Resources
Alan Grant
Dean, College of Agriculture and Life Sciences
Sue Ott Rowlands
Dean, College of Liberal Arts and Human Sciences
Gerhardt G. Schurig
Dean, Virginia-Maryland Regional College of Veterinary Medicine
Richard E. Sorensen
Dean, Pamplin College of Business
T. Marshall Hahn, Jr.
President Emeritus
Paul E. Torgersen
President Emeritus

FACULTY

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti

- The university employs over 4,700 faculty and staff at the Blacksburg campus and many more in support of university programs throughout the Commonwealth of Virginia.
- Listings include (with very few exceptions) collegiate faculty members and administrators at the director level and above. *Please note that in an effort to focus on academics and on student interests and services, many staff essential to the operation of the university are not listed*.

Faculty Honors (2000 to present) (1957 to 1999)

- Academic Advising Awards
- Academy of Faculty Service
- Academy of Teaching Excellence Inductees
- Alumni Extension Award Winners
- Alumni International Programs Award Winners
- Alumni Research Award Winners
- Alumni Teaching Award Winners
- Commonwealth of Virginia Outstanding Faculty
- Diggs Teaching Scholar Awards
- Distinguished Professors, Alumni
- Distinguished Professors, University
- Sporn Award Winners
- University Exemplary Department Awards
- University Public Service Award Recipients
- Wine Award Winners

Faculty & Administrators: A B

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

A

ABAYE, A. Ozzie (1992), Assoc. Prof. of Crop and Soil Environmental Sciences. B.S., Wilson College (PA), 1984; M.S., Penn State, 1987; Ph.D., Virginia Tech, 1992.

ABBAS, Montasir (2005), Asst. Prof. of Civil and Environmental Engineering. B.S. Univ. of Khartoum (SUDAN), 1993; M.S. Univ. of Nebraska-Lincoln, 1997; Ph.D., Purdue Univ., 2001, P.E.

ABBATE, Janet (2004), Asst. Prof. of Science and Technology in Society. B.A., Harvard-Radcliffe College, 1985; M.A., Univ. of Pennsylvania, 1988; Ph.D., Univ. of Pennsylvania, 1994.

ABBOTT, A. Lynn (1990), Assoc. Prof. of Electrical and Computer Engineering. B.S., Rutgers, 1990; M.S., Stanford, 1981; Ph.D., Illinois, 1989.

ABBOTT, Jonathan A. (2000), Assoc. Prof. of Small Animal Clinical Sciences. D.V.M., Guelph (Canada), 1989; Diplomate, ACVIM (Cardiology).

ABEYSEKARA, Ananda (1999), Assoc. Prof. of Religious Studies; Director of Religious Studies Program in the Department of Interdisciplinary Studies. B.A. Macalister College, 1992; M.A. UVa., 1994; Ph.D, Northwestern Univ., 1999.

ABIADE, Jeremiah (2007), Asst. Prof. of Materials Science and Engineering and Mechanical Engineering. B.S., Southern Univ. and A & M College, 1999; Ph.D., Univ. of Florida, 2004.

ABIRAGI, Anthony (2008), Asst. Prof. of French. B.A., Tufts Univ., 1994; M.A., New York Univ. 1997; M.A., New School for Social Research, 2003; Ph.D., New York Univ., 2008.

ABRAHAMS, Alan S. (2007), Asst. Prof. of Business Information Technology. B.S., Cape Town, 1997; Ph.D., Cambridge, 2002.

ACHENIE, Luke E.K. (2007), Prof. of Chemical Engineering. B.S., Massachusetts Institute of Technology, 1981; M.S., Northwestern, 1982; M.A.M., Carnegie Mellon, 1984; Ph.D., Carnegie Mellon, 1988.

ADAMS, David R. (2009), Director, Learning Systems Integration and Support. B.S., Missouri State Univ., 1998.

ADAMS, Inga (2009), Acting Director for the Multicultural Academic Opportunities Program (MAOP). B.S., North Carolina A&T State Univ., 2002; M. S.Ed., Virginia Tech, 2008.

ADAMS, M. Norris (2008), Clinical Asst. Prof. of Surgery and Lameness, Marion duPont Scott Equine Medical Center. B.S., Cornell Univ., 1988; D.V. M., Mississippi State Univ., 1992; Diplomate A.C.V.S., 1999.

ADEL, Gregory T. (1982), Prof. of Mining and Minerals Engineering. B.S., South Dakota School of Mines and Technology, 1978; M.S., South Dakota School of Mines and Technology, 1979; D.Eng., California, Berkeley, 1982.

ADELMAN, Zachary N. (2005), Asst. Prof. of Entomology, B.A., Ithaca College, 1996; Ph.D., Colorado State Univ., 2000.

ADJERID, Slimane (1998), Assoc. Prof. of Mathematics. B.S., Univ. of Algiers, 1979; M.S., Rensselaer Polytechnic Institute, 1982; Ph.D.,

Rensselaer Polytechnic Institute, 1985.

ADLER, John (2008), Asst. Prof. of Music. B.A., Univ. of Nevada-Reno, 2001; M.M., Univ. of Oregon, 2004.

AGAH, Masoud (2005), Asst. Prof. of Electrical and Computer Engineering. B.S in EE, Sharif Univ. of Technology, Tehran, Iran, 1996; BS EE, Sharif Univ. of Technology, 1998; Ph.D., Univ. of Michigan, 2005.

AGBLEVOR, Foster Aryi (1996), Assoc. Prof. of Biological Systems Engineering. B.S., Univ. of Science and Technology, Ghana, 1978; M.S., Univ. of Toronto, 1984; Ph.D., Univ. of Toronto, 1988.

AGNEW, Michael (2007), Asst. Prof. of Industrial and Systems Engineering. B.A., Wilfrid Laurier Univ., 2000; M.S., Univ. of Windsor, 2003; Ph.D., Queen's Univ., 2008.

AGOZINO, Onwubiko, (2009), Prof. of Sociology and Africana Studies. B.S., Univ. of Calabar-Nigeria, 1985; M.Phil., Univ. of Cambridge, UK, 1990; Ph.D., Univ. of Edinburgh, 1993.

AGUD, Diane B. (1993), Senior Instructor of Mathematics. B.A., Molloy College, 1985; M.A., St. John's Univ., 1990.[4]

AHMADIAN, Mehdi (1995), Prof. of Mechanical Engineering. B.S., SUNY, Buffalo, 1980; M.S., SUNY, Buffalo, 1982; Ph.D., SUNY, Buffalo, 1984.

AHMED, S. Ansar (1989), Department Head and Prof. of Biomedical Sciences and Pathobiology. B.Sc., Bangalore (India), 1972; B.V.Sc., UAS (India), 1977; Ph.D., Murdoch U. (Perth, Australia), 1985.

AKERS, R. Michael (1981), Horace E. and Elizabeth F. Alphin Prof. of Dairy Science. A.S., Wytheville CC, 1972; B.S., Virginia Tech, 1974; M.S., Virginia Tech, 1976; Ph.D., Michigan State, 1980.[6]

ALAVALAPATI, Janaki (2008), Prof. and Department Head of Forestry. M.S., S.V. Univ. (India), 1975; M.S., State Forest Service College (India), 1982; M.S., Univ. of Alberta (Canada), 1990; Ph.D., Univ. of Alberta, 1995.

ALBIMINO, Samuel V. (2007), Assoc. Vice President, Alumni Relations. B.S., Virginia Tech, 1985; M.B.A., Virginia Tech, 1992.

ALBRIGHT, Kathryn C. (1994), Asst. Director, and Chair, Foundation Program in Architecture; Assoc. Prof. of Architecture. B.Arch., Virginia Tech, 1982; M.Design Studies, Harvard, 1994.

ALEXANDER, Kathleen A. (2007), Assoc. Prof. of Wildlife Science. B.S., Univ. of California-Davis, 1988; D.V.M., Univ. of California-Davis, 1992; Ph. D., Univ. of California-Davis, 1995.

ALEXANDER, Michael D. (1972), Prof. of Education. B.S., Western Ky., 1966; Ed.D., Indiana, 1969.

ALI, Ray A. (2006), Assoc. Director for Field Operations, Extension. B.S., Univ. of Pittsburgh, 1977; M.A.T., Univ. of Pittsburgh, 1998; Ed.D., Marshal Univ., 2005.

ALLEN, Barbara (2000), Assoc. Prof. of Science and Technology in Society; Assoc. Director of Science and Technology Studies and Director of the Graduate Program in STS, National Capital Region. B.S., Univ. of Colorado, Boulder, 1976; M.S., Columbia, 1977; Ph.D., Rensselaer Polytechnic Institute, 1999.

ALLEN, Katherine R. (1989), Prof. of Human Development. B.S., Univ. of Connecticut, Storrs, 1976; M.A., Syracuse, 1980; Ph.D., Syracuse, 1984.

ALLEY, Marcus M. (1977), W. G. Wysor Prof. of Crop and Soil Environmental Sciences. B.S., Berea, 1969; M.S., Virginia Tech, 1971; Ph.D., Virginia Tech, 1975.

ALLINGHAM, Liesl A. (2008), Asst. Prof. of German. B.A., Tufts Univ., 1990; M.A., Indiana Univ., 1995; Ph.D., Indiana Univ., 2007.

ALLNUTT, Robin (2002), Instructor of English. B.A., Virginia Tech, 1987; M.F.A., George Mason Univ., 1997.

ALWANG, Jeffrey R. (1989), Prof. of Agricultural and Applied Economics. B.A., Penn State, 1978; M.S., Penn State, 1985; Ph.D., Cornell, 1987.

AMACHER, Gregory S. (1994), Julian N. Cheatham Prof. of Forest Economics. B.S., Penn State, 1984; M.A., Michigan, 1989; M.A., Michigan, 1990; M.S., Michigan, 1991; Ph.D., Michigan, 1993.

AMATEIS, Patricia G. (1996), Assoc. Prof. of Chemistry. B.S., Concord, 1979; P.h.D., Virginia Tech, 1984.[2,4,7]

AMBROSONE, John (2004), Asst. Prof. of Theatre Arts. B.A., State Univ. of New York at Fredonia, 1983; M.F.A., Virginia Tech, 1986.

ANDERS, Charlotte (1981), Assoc. Director of Program Development, Continuing and Professional Education. ÊB.S., Virginia Tech, 1988; M.S., Virginia Tech, 1991.

ANDERSEN, Christopher (2005), Asst. Prof. of Aerospace Studies, Air Force ROTC. B.A., Faulkner Christian Univ., 2001; M.B.A., TOURO Univ. International, 2004.

ANDERSON, Glenn A., Specialist, Agricultural Education. B.S., Virginia Tech, 1968; M.S., Virginia Tech, 1972; Ed.D., Virginia Tech, 1985.

ANDERSON, Linda (1987), Prof. of English. B.A., Univ. of Minnesota, 1973; Ph.D., Univ. of Minnesota, 1984.

ANDERSON, Susan G. (1982), Senior Instructor of Mathematics. B.S., Mary Washington, 1980; M.S., Virginia Tech, 1982.

ANDREWS, Robin M. (1976), Prof. of Zoology. B.A., Univ. of Minnesota, 1964; A.M., Harvard, 1967; Ph.D., Univ. of Kansas, 1971.

ANGEL, J. Ross (2001), Research Prof. of Crystallography. B.A., Univ. of Cambridge, 1982; M.A., Univ. of Cambridge, 1986; Ph.D., Univ. of Cambridge, 1986.

ANGERMEIER, Paul L. (1988), Prof. of Fisheries and Asst. Leader, Coop. Fish and Wildlife Research Unit. B.S., Purdue, 1976; M.S., Illinois, 1979; Ph.D., Illinois, 1982.

ANING, Alexander O. (1992), Assoc. Prof. of Materials Science and Engineering. B .S., Morgan State Univ., 1976; Ph.D., Univ. of Missouri-Rolla, 1982.

ANONG, Sophia (2006), Asst. Prof. of Apparel, Housing, and Resource Management. B.S., Africa Univ., 1997; M.S., Purdue Univ., 2003; Ph.D., Purdue Univ., 2006.

APPLETON, Bonnie L. (1985), Prof. of Horticulture. B.S., Delaware, 1970; M.S., Delaware, 1975; Ph.D., Oklahoma State, 1983. (Hampton Roads Agricultural Research & Extension Center).

ARAMAN, Judith C. (2006). Lecturer, College of Natural Resources. B.A., Univ. of North Carolina at Greensboro, 1969; M.A., West Virginia Graduate College, 1987.

ARAV, Nahum (2007), Assoc. Prof. of Physics. B.S., Univ. of Tel Aviv, 1990; Ph.D., Univ. of Colorado, 1994.

ARDITTI, Joyce A. (1989), Assoc. Prof. of Human Development. B.S., Univ. of Georgia, 1980; M.A., Univ. of Connecticut, 1982; Ph.D., Univ. of North Carolina, Greensboro, 1988.

AREF, Hassan (2003), Reynolds Metals Professor of Engineering Science and Mechanics. B.S., Univ. of Copenhagen, 1975; Ph.D., Cornell Univ., 1980.

ARMSTRONG, James R. (1975), Prof. Emeritus of Electrical and Computer Engineering. B.S., Marquette, 1961; M.S., Marquette, 1971; Ph.D., Marquette, 1975.

ARMSTRONG, Mark R. (1995), Instructor of English. B.A., Davidson College, 1977; M.A., Univ. of North Carolina at Greensboro, 1985; Ph.D., Univ. of North Carolina at Greensboro, 1995.

ARNER, Alison E. (1999), Fitness Coordinator, Recreational Sports. B.S., Univ. of Southern Mississippi, 1999; M.S., Virginia Tech, 2001.

ARNOLD, Linda (1982), Prof. of History. B.A., Cal State (Long Beach), 1971; M.A., Texas, 1975; Ph.D., Texas, 1982.

AROGO OGEJO, Jactone (2005), Asst. Prof. of Biological Systems Engineering. B.S., University of Nairobi, Kenya, 1983; M.S., Illinois, 1989; Ph.D., Illinois, 1997.

ARSENAULT, Rhonda K. (2001), Assoc. Vice President for Advancement Services. B.A., Univ. of Illinois at Urbana-Champaign, 1990; M.S., Univ. of Illinois at Urbana-Champaign, 1992.

ARTHUR, James D. (1983), Assoc. Prof. of Computer Science. B.S., UNC-G, 1972; M.A., UNC-G, 1973; M.S. Houston, 1979; M.S., Purdue, 1981; Ph.D., Purdue, 1983.[2,7]

ARTHUR, Jeffrey B. (2000), Assoc. Prof. of Management. B.S., Univ. of California (Santa Cruz), 1983; M.S., Cornell, 1987; Ph.D., Cornell, 1990.

ASCHMANN, Althea (1998), Asst. Prof.; Library. B.A., Kansas, 1975; M.L.S., Kent State, 1976.

ASHLEY, Richard A. (1981), Prof. of Economics. B.S., Cal Tech, 1971; M.S., California (San Diego), 1972; Ph.D., California (San Diego), 1982.

ASKEW, Shawn D. (2001), Assoc. Prof. of Weed Science. B.S. Mississippi State Univ., 1995; M.S., Mississippi State Univ., 1997; Ph.D. North Carolina State Univ., 2001.

ASRYAN, Levon V. (2004), Assoc. Prof. of Materials Science and Engineering. M.S., Yerevan State Univ., 1985; Ph.D., Ioffe Institute (St. Petersburg, Russia), 1988; Dr.Sci., Ioffe Institute of Physics and Technology (St. Petersburg, Russia), 2002.

ASSELIN, Susan B. (1982), Prof. of Education. B.S., FSU, 1972; M.S., FSU, 1974; Ph.D., Nebraska, 1982.

ATHANAS, Peter M. (1992), Prof. of Electrical and Computer Engineering. B.S., Toledo, 1983; M.S., Rensselaer, 1985; S. M., Brown, 1990; Ph.D., Brown, 1992.

AUST, W. Michael (1989), Prof. of Forestry. B.S., Mississippi State, 1982; M.S., Mississippi State, 1985; Ph.D., North Carolina State, 1989.

AVERY, Roger J. (1999), Prof. of Biomedical Sciences and Pathobiology. B.S. (1st Class Honors) Leeds (UK), 1966; Ph.D., Newcastle-upon-Tyne (UK), 1969.

AXSOM, Danny K. (1987), Assoc. Prof. of Psychology. B.A., UVa., 1977; M.A., Princeton Univ., 1979; Ph.D., Princeton Univ., 1984.

AZEKE, Mercy O. (2006), Director of Academic Advising and Student Services, Pamplin College of Business. B.S., Univ. of Nigeria, 1978; M.Ed., Temple, 1980; Ed.D., Temple, 1985.

TOP

B

BACK, Donald (2007), Director, English Language Institute. B.S., Wright State Univ., 1983; M.Ed., Univ. of Massachusetts, 1989.

BACK, Godmar (2004), Asst. Prof. of Computer Science. B.S., Technical Univ. of Berlin, 1994; Ph.D., Univ. of Utah, 2002.

BADAWY, Michael K. (1984), Prof. of Management. B.B.A., Cairo (Egypt), 1961; M.B.A., Indiana, 1965; Ph.D., NYU, 1969. (Northern Virginia Center)

BADINELLI, Kimberle (1985), Assoc. Director of Administration for Communications and Marketing, Division of Student Affairs. B.S., Virginia Tech, 1977; M.S., Virginia Tech, 1992.

BADINELLI, Ralph D. (1985), Prof. of Business Information Technology. B.S., Hofstra, 1974; M.S., Purdue, 1976; M.S., Purdue, 1978; Ph.D., Purdue, 1982.

BAILEY, Annette (2005), Asst. Prof.; Library. B.A., North Carolina State, 1996; M.S., Univ. of Illinois at Urbana-Champaign, 2001.

BAILEY, Carol A. (1987), Assoc. Prof. of Sociology. B.S., Charleston, 1977; M.A., Wash. State, 1979; Ph.D., Wash. State, 1986.[2,3,7]

BAILEY, Lynda K. (1997), Sr. Asst. Director of Undergraduate Admissions. B.A., Lynchburg College, 1984.

BAILEY, Scott (2006), Assoc. Prof. of Electrical and Computer Engineering. B.S., Virginia Tech, 1990; M.S., Univ. of Colorado, 1994; Ph.D., Univ. of Colorado, 1995.

BAIN, Carolyn U. (2004), Asst. Director, Alumni Relations. B.S., High Point Univ.,1996.

BAIRD, Donald G. (1978), Harry C. Wyatt Prof. of Chemical Engineering. B.S., Michigan State, 1969; M.S., Michigan State, 1971; Ph.D., Wisconsin, 1974.[6]

BAKER, Joseph B. (2008), Asst. Prof. of Electrical and Computer Engineering. B.Sc., Univ. of New England, Australia, 1992; Ph.D., Univ. of Michigan, 2001.

BALCI, Osman (1981), Prof. of Computer Science. B.S., Bogazici, Turkey, 1975; M.S., Bogazici, Turkey, 1977; M.S., Syracuse, 1978; Ph.D., Syracuse, 1981.

BALES, Max (2003), Director of Development. B.S., Purdue, 1989.

BALL, Gene (2001), Asst. Director for International Finance and Human Resources. B.S., Virginia Tech, 1981; M.B.A., Virginia Tech, 1999.

BALL, Joseph A. (1973), Prof. of Mathematics. B.S., Georgetown, 1969; M.S., Virginia, 1970; Ph.D., Virginia, 1973.[6]

BALL, Kenneth S. (2004), Lingan S. Randolph Prof. of Mechanical Engineering and Department Head. B.S., Lehigh, 1982; M.S., Drexel, 1984; Ph. D., Drexel, 1987.

BALL, Sheryl B. (1992), Assoc. Prof. of Economics and Assoc. Dean for Curriculum, Instruction, and Advising, College of Science. B.A., Northwestern Univ., 1984; M.S., Northwestern Univ.; 1986; Ph.D., Northwestern Univ., 1991.[1,2,7,10]

BANDARA, Aloka B. P. A. (2005), Research Asst. Prof. of Biomedical Sciences and Pathobiology. B.S., Sri Lanka, 1985; M.S., Sri Lanka, 1989; Ph. D., Virginia Tech, 1998.

BANERJEE, Diya (2006), Asst. Prof of Molecular and Cellular Biology. B.A., Williams College, 1993; Ph.D., Univ. of Illinois, 2000.

BANNAN, Diane H. (2000), Instructor of Art; Associate Director of Academic Advising. B.A., Virginia Tech, 1986; M.F.A., Pratt Institute, 1989.

BARBEAU, William E. (1985), Assoc. Prof. of Human Nutrition, Foods and Exercise. B.A., Massachusetts, 1969; M.S., Massachusetts, 1976; Ph.D., Cornell, 1984.

BARBER, Don L. (1984), Prof. of Small Animal Clinical Sciences. B.S., California (Davis), 1967; D.V.M., California (Davis), 1971; M.S., Colorado State, 1975; Diplomate, A.C.V.R.

BARBOUR, Kate (2001), Assoc. Director of Administration for Student Affairs. B.B.A., Univ. of Miami, 1978; M.S., Univ. of Central Florida, 1980.

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BURCH-BROWN, Carol (1979), Prof. of Art. B.A., Abilene Christian Univ., 1974; M.F.A., The Univ. of Chicago, 1977.

BURDISSO, Ricardo A. (1992), Prof. of Mechanical Engineering and Asst. Dept. Head for Graduate Studies. B.S., Nat. Univ. of Cordoba, Argentina, 1981; M.S., Virginia Tech, 1984; Ph.D., Virginia Tech, 1986.

BURGE, Penny L. (1979), Prof. of Education. B.S., Indiana Univ. of Pennsylvania, 1969; M.Ed., Indiana Univ. of Pennsylvania, 1972; Ph.D., The Pennsylvania State Univ., 1979.

BURGER, Carol J. (1984), Assoc. Prof. of Women's Studies (Interdisciplinary Studies) and Asst. Prof. of Microbiology and Immunology (Biology). B. A., Rosary College, 1965; Ph.D., Virginia Tech, 1983.[2, 4]

BURGOYNE, Christine B. (2004), Instructor of Materials Science and Engineering and of Engineering Science and Mechanics, Asst. Director of the MSE/ESM Communications Program. B.A., Univ. of the Philippines, 1995; M.A., Virginia Tech, 2001.

BURKARDT, John V. (2007), Computational Science Specialist, Information Technology. B.S., Massachusetts Inst. of Technology, 1975; M.S., Univ. of Pittsburgh, 1978; Ph.D., Virginia Tech, 1995.

BURKHART, Harold E. (1969), Univ. Distinguished Prof., Thomas M. Brooks Prof. of Forest Biometrics. B.S., Oklahoma State, 1965; M.S., Georgia, 1967; Ph.D., Georgia, 1969.[6,9]

BURKS, Amanda E. (2007), Assoc. Univ. Legal Counsel. B.A., James Madison Univ., 1997; M.A., Univ. of South Carolina, 1999; J.D., Washington & Lee Univ. School of Law, 2002.

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BURNS, John A. (1974), Hatcher Prof. of Mathematics. B.S.Ed., Arkansas State, 1967; M.Ed., Arkansas State, 1968; M.A., Oklahoma, 1970; Ph.D., Oklahoma, 1973.

BURNSED, C. Vernon (1978), Prof. of Music. B.M., Georgia Southern, 1968; M.M., Miami (Fla), 1976; Ph.D., Miami (Fla), 1978.

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BUSBY, Gwenlyn (2008), Asst. Prof. of Forest Economics and Policy. B.A., Middlebury College, 2000; M.E.Sc., Yale, 2002; Ph.D., Oregon State, 2008.

BUSH, Kristen H. (1998), Director, Institutional Research & Effectiveness. B.S., Concord College, 1985; M.S., Virginia Tech, 1991; Ph.D., Oklahoma State Univ., 1997.

BUSH, Robert J. (1989), Prof. of Forest Products Marketing, and Assoc. Dean, College of Natural Resources. B.S., Minnesota, 1984; M.S., Virginia Tech, 1986; Ph.D., Virginia Tech, 1989.

BUTT, Ali (2007), Asst. Prof. of Computer Science. B.S., Univ. of Engineering and Technology, 2000; Ph.D., Purdue Univ., 2006.

BYERS, Ralph M. (1990), Executive Director of Government Relations. B.A., Emory University, 1967; M.A., Univ. of Virginia, 1971.

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Faculty & Administrators: C D

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

C

CACECI, Thomas (1987), Assoc. Prof. of Biomedical Sciences and Pathobiology. A.B., Kenyon, 1969; Ph.D., Georgetown, 1980.

CAIN, Jerry D. (1988), Assoc. University Legal Counsel. B.A., Univ. of Texas, 1965; J.D., SMU, 1965.

CALASANTI, Toni M. (1987), Prof. of Sociology. B.A., Loyola-Marymount, 1977; M.A., Kentucky, 1981; Ph.D., Kentucky, 1987.

CALVERA, Elizabeth C. (1980), Instructor of Spanish. B.A. Carnegie Mellon, 1963; M.A., Virginia Tech, 1978.

CAMDEN, Samuel (1997), Assoc. Director of Administration for Human Resources, Division of Student Affairs. B.S., Virginia Tech, 1968.

CAMELIO, Jaime A. (2008), Asst. Prof. of Industrial and Systems Engineering. B.S., Universidad Catolica de Chile, 1994; M.S., Universidad Catolica de Chile, 1996; M.S., Univ. of Michigan, 2002; Ph.D., Univ. of Michigan, 2002.

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CAMPBELL, Allen W. (2006), Coordinator of University Budget Systems. B.S., Clemson Univ., 1986; M.S., Virginia Tech, 1991.

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CAPELLUTO, Daniel (2005), Asst. Prof. of Molecular and Cellular Biology. B.S., Univ. of Buenos Aires, 1989; M.S., Univ. of Valencia, 1994; Ph.D., Univ. of Buenos Aires, 1997.

CAPONE, T. Truman (1996), Director, School of Visual Arts; Director of Collaboration for Creative Technologies in the Arts and Design; Prof. of Art. B.A., Edinboro Univ. of Pennsylvania, 1972; M.S., Virginia Tech, 1983; M.F.A., Radford Univ., 1993.

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CARROLL, David F. (2008), Instructor of Geography. B.S., Virginia Tech, 1984; M.S., Mississippi State, 2001.

CARSTENSEN, Laurence W. (1983), Prof. and Department Head of Geography. B.A., UNC, 1976; M.A., UNC, 1978; Ph.D., UNC, 1981.

CARTER-TOD, Sheila L. (2000), Asst. Prof. of English. B.A., Virginia Tech, 1989; M.A., Radford, 1991; Ph.D., Virginia Tech, 1995.

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CHAPMAN, Martin C. (1998), Research Asst. Prof. in Geosciences. B.S., Virginia Tech, 1977; M.S., Virginia Tech, 1979; Ph.D., Virginia Tech, 1998.

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COLLIER, James H. (2001), Assoc. Prof. of English. B.A., Virginia Tech, 1983; M.A., Virginia Tech, 1987; Ph.D., Virginia Tech, 1998.

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COMBITHS, Z. Katherine (2004), Instructor of English. B.A., Roanoke College, 1997; M.S., Radford Univ., 2002.

CONEV, Rumen (2007), Asst. Prof. of Horticulture. B.S., Plovdiv, Bulgaria, 1984; Ph.D., Plovdiv, Bulgaria, 1992.

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COPENHAVER, Kristin F. (2009), Accounts Payable/TVB Manager. B.S., Virginia Tech, 1996; MBA, Virginia Tech, 2002.

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CORTES, Mario (1991), Assoc. Prof. of Architecture. B.A., Wash. Univ., St. Louis, 1979; M.Arch., Virginia Tech, 1986.

CORVIN, Thimothy G. (1996), Assoc. Vice President for Development. B.S., Virginia Tech, 1975; M.S., Virginia Tech, 1980.

COTHREN, Marlene (1993), Instructor of Mathematics. B.S., Guilford College, 1971; M.A., Wake Forest Univ., 1972; M.S., Univ. of Illinois, 1975.

COTHREN, Richard D., (1985), Assoc. Prof. of Economics. B.S., Wake Forest, 1973; M.S., Illinois, 1975; Ph.D., UNC, 1981.

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COUSINS, Thomas E. (1996), Prof. of Civil and Environmental Engineering. B.S., Clemson Univ., 1978; M.S., Clemson Univ., 1982; Ph.D., North Carolina State, 1986; P.E.

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COWELL-LUCERO, Jamie (2006), Asst. Director, Alumni Relations. B.S., Central Missouri State Univ., 1999; M.S., Kansas State, 2001.

COX, David F. (1986), Prof. of Chemical Engineering. B.S., Tennessee, 1979; M.S., Florida, 1980; Ph.D., Florida, 1984.

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COX, William E. (1972), Asst. Head and Prof. of Civil and Environmental Engineering. B.S., Virginia Tech, 1966; M.S., Virginia Tech, 1968; Ph.D., Virginia Tech, 1976.

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CRANE, David F. (1980), Prof. of Art. B.F.A., Northern Arizona Univ., 1976; M.F.A., Illinois State Univ. at Normal, 1978.

CRAWFORD, T. Daniel, (2000), Prof. of Chemsitry. B.S., Duke Univ., 1992; Ph.D., Univ. of Georgia, 1996.

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CROSS, Travis (2008), Asst. Prof. of Music. B.M., St. Olaf College, 1999; M.M., Northwestern Univ., 2006.

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DANCEY, Clinton L. (1983), Asst. Department Head for Undergraduate Studies and, Assoc. Prof. of Mechanical Engineering. B.S., Bradley, 1972; M. S., Iowa State, 1974; Ph.D., Cornell, 1984.

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DAY, Martin V. (1980), Prof. of Mathematics. B.S., Cal State (Hayward), 1973; M.A., Colorado, 1975; Ph.D., Colorado, 1978.

DAY, Susan D. (2008), Asst. Prof. of Urban Forestry. B.A., Yale, 1985; M.S., Cornell Univ., 1993; Ph.D., Virginia Tech, 1999.

DAY-VINES, Norma (2005), Assoc. Prof. of Education. B.A., Univ. of North Carolina at Chapel Hill, 1984, M.A.Ed., North Carolina State Univ., 1987; Ph.D., North Carolina State Univ., 1998. (National Capital Region)

DE BEURS, Kirsten M. (2007), Asst. Prof. of Geography. B.S., Wageningen Agricultural Univ. (the Netherlands), 1996; M.S., Wageningen Agricultural Univ., 2000; Ph.D., Univ. of Nebraska, 2005.

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DE LA GARZA, Jesus M. (1988), Prof. of Civil and Environmental Engineering. B.S., Tecnologico de Monterrey, Mexico, 1978; M.S., Univ. of Illinois, 1984; Ph.D, Univ. of Illinois, 1988; P.E.

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DE STURLER, Eric (2006), Assoc. Prof. of Mathematics. M.S., Technical Univ., Delft, 1990; Ph.D., Technical Univ., Delft, 1994.

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DECK, Paul (1995), Assoc. Prof. of Chemistry. B.S., Hope College, 1987; Ph.D., Minnesota, 1993.

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DENBOW, Cynthia J. (1980), Research Scientist in Plant Physiology. B.S. NC State, Raleigh, 1977; M.S., N.C. State, Raleigh, 1980; Ph.D., Virginia Tech, 1997.

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DENTON, Jr., Robert E. (1988), W. Thomas Rice Chair; Prof. of Communication. B.A., Wake Forest Univ., 1975; M.A., Wake Forest Univ., 1977; Ph. D., Purdue, 1980.

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DICKERT, Robert M. (2009), Director, Computer-Integrated Learning Spaces. B.S., Virginia Tech, 1999.

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DIETZ, Kira A. (2009), Instructor; Library. B.A., Univ. of Delaware, 2003; M.A., Univ. of Tennessee, 2005; M.L.S., Univ. of Maryland, 2007.

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DOLBIN-MacNAB, Megan (2004), Asst. Prof. of Human Development. B.S., The Pennsylvania State Univ., 1997; M.S., Purdue Univ., 1999; Ph.D., Purdue Univ., 2004.

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DOOLITTLE, Peter (1998), Assoc. Prof. of Education. B.A., Southern Methodist Univ., 1983; M.S., Baylor Univ., 1984; Ph.D., Catholic Univ. of America, 1993.

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DOWNEY, Gary L. (1983), University Alumni Distinguished Professor; Prof. of Science and Technology in Society; Adjunct Prof., Dept. of Sociology. B.A., Lehigh, 1974; B.S., Lehigh, 1974; M.A Chicago, 1977; Ph.D., Chicago, 1981. [3,10]

DOWNS, Edward (2007), Asst. Prof. of Military Science. B.A., Virginia Tech, 1999; M.S., Webster Univ., 2003.

DU, Pang (2006), Asst. Prof. of Statistics. B.S., Univ. of Sci. & Tech. of China, 1996; M.S. Univ. of Sci. & Tech of China, 1999; M.A. and MS.E., Johns Hopkins Univ., 2002; M.S., Purdue Univ., 2003; Ph.D., Purdue Univ., 2006.

DUBINSKY, James (1998), Assoc. Prof. of English. B.A., Wake Forest Univ., 1977; M.A., Univ. of California at Berkeley, 1986; Ph.D., Miami Univ. of Ohio, 1998.[10]

DUBNJAKOVIC, Ana (2007), Instructor; Library. B.A., Univ. of New Orleans, 1999; M.M., Univ. of New Orleans, 2002; D.M.A., Univ. of Arizona, 2003; M.L.I.S, Louisiana State Univ., 2004.

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DUDLEY, Larkin S. (1992), Department Chair and Assoc. Prof. of Public Administration and Policy. A.B., Univ. Georgia; M.A., Univ. Georgia; Ph.D., Virginia Tech, 1990.

DUGAS, David (1986), Assoc. Prof. of Architecture. B.Arch., Univ. of Southwestern Louisiana, 1982; M.Arch., Virginia Tech, 1985.

DUKE, Jr., John C. (1978), Prof. of Engineering Science and Mechanics. B.E.S., Johns Hopkins, 1973; M.S.E., Johns Hopkins, 1976; Ph.D., Johns Hopkins, 1978.

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DUNAY, Donna W. (1975), Prof. of Architecture. B.Arch., Virginia Tech, 1971; M.Arch., Virginia Tech, 1974.

DUNAY, Robert J. (1976), T. A. Carter Endowed Prof. of Architecture; Director of the Center for Design Research. B.Arch., Virginia Tech, 1971; M. Arch., Virginia Tech, 1979.

DUNCAN, Susan E. (1989), Prof. of Food Science and Technology. B.S., Ohio State Univ., 1981; M.S. Indiana Univ. of Pennsylvania, 1987: Ph.D. The Univ. of Tennessee, 1989.

DUNKER, Mary B. (2004), Director of Secure Enterprise Technology Initiatives. B.S., Hollins Univ., 1974.

DUNN, Allison (2006), Asst. Director of CoCurricular Leadership Programs, UUSA. B.A., Brigham Young Univ., 1996; M.S., Texas A & M, 2001.

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DUNSMORE, Julie C. (2003), Asst. Prof. of Psychology. B.A., Emory Univ., 1990; M.A., Duke Univ., 1992; Ph.D., Duke Univ., 1994.

DUNSTON, Michael E. (1997), Instructor of Music. B.A., Virginia Tech, 1993.

DURHAM, Wayne C. (1990), Assoc. Prof. Emeritus of Aerospace and Ocean Engineering. B.S., U.S. Naval Academy, 1965; M.S., Naval Postgraduate School, 1984; Ph.D., Virginia Tech, 1989.

DYER, Harry (2000), Instructor of American Indian Studies and Humanities. B.A., Tennessee Wesleyan College, 1984; M.Div., Lutheren Theological Southern Seminary, 1994; M.F.A., Univ. of Montana, 1997.

DYMOND, Randel L. (1998), Assoc. Prof. of Civil and Environmental Engineering. B.S., Penn State (1979); M.S., Penn State (1980); Ph.D., Penn State (1987); P.E.[7]

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Faculty & Administrators: E F G

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

E

EASTER, Wallace E. (1981), Assoc. Prof. of Music. B.A., Oberlin, 1969; M.M., Catholic, 1973.

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EASTERWOOD, John C. (1992), Assoc. Prof. of Finance. B.S., Univ. of Alabama-Tuscaloosa, 1978; Ph.D., Univ. of Texas-Austin, 1985.

EBRAHIM, Alnoor (1999), Assoc. Prof. in Urban Affairs and Planning and in Government and International Affairs. B.S., Massachusetts Institute of Technology, 1991; M.S., Stanford, 1994; Ph.D., Stanford, 1999.

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EDGAR, Kevin J. (2007), Prof. of Biomaterials and Bioprocessing. B.S., Bucknell Univ., 1975; Ph.D., Duke Univ., 1979.

EDGE, Kay (2001), Assoc. Prof. of Architecture. M.Ed., Yale, 2001; M.Arch., Virginia Tech.

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EDWARDS, Erin (2003), Director of Development, Engineering. B.A., Univ. of North Florida, 1994.

EDWARDS, Marc E. (1997), Prof. of Civil and Environmental Engineering. B.S., SUNY Buffalo, 1986; M.S., Univ. of Washington (Seattle), 1988; Ph.D., Univ. of Washington (Seattle), 1991; E.I.T.[6]

EDWARDS, Stephen H. (1997), Assoc. Prof. of Computer Science. B.S., California Institute of Technology, 1988; M.S., The Ohio State Univ., 1992; Ph. D., The Ohio State Univ., 1995.

EFIRD, Robert O. (2008), Asst. Prof. of Russian. B.A., James Madison Univ., 1997; M.A., Indiana Univ.,1999; Ph.D., Univ. of Virginia, 2006.

EGGER, D. Eugene (1969), Patrick and Nancy Lathrop Prof. of Architecture, Director of Special Programs. B.A., Auburn, 1965; M.Arch., Virginia Tech, 1974; R.A.[2,3]

EGYHAZY, Csaba J. (1981), Assoc. Prof. of Computer Science. B.S., Case Institute, 1972; M.S., Case Western, 1974; Ph.D., Case Western, 1976. (Northern Virginia Center).

EHRICH, Marion F. (1980), Prof. of Biomedical Sciences and Pathobiology. B.S., South Dakota, 1968; M.S., Chicago, 1970; Ph.D., Connecticut, 1975; Diplomate, A.B.T.

EHRICH, Roger W. (1976), Prof. of Computer Science. B.S., Rochester, 1965; Ph.D., Northwestern, 1969.

EICHHORN, Lynn (1994), Executive Director, Planning, Construction, and Design. B.A., Univ. of Kentucky, 1980.

EICK, Matthew J. (1997), Assoc. Prof. of Crop and Soil Environmental Sciences. B.S., Virginia Tech, 1987; M.S., Delaware, 1989; Ph.D., Delaware, 1995.

EIFERT, Joseph D. (1994), Assoc. Prof., Food Science and Technology. B.S. Loyola Marymount Univ., 1980; M.S. Virginia Tech, 1991; Ph.D. Virginia Tech, 1994.

EIGEL, William N. (1973), Assoc. Prof., Food Science and Technology. B.S., The Univ. of Kentucky, 1968; Ph.D. Texas A & M Univ., 1973.

EISENBACK, Jonathan D. (1985), Prof. of Plant Pathology. B.S. Bryan College, 1974; Ph.D., North Carolina State Univ., 1979.

EKIRCH, A. Roger (1977), Prof. of History. A.B., Dartmouth, 1972; M.A., Johns Hopkins, 1974; Ph.D., Johns Hopkins, 1978[6].

EKKAD, Srinath (2007), Assoc. Prof. of Mechanical Engineering. B.Tech., Jawaharlal Nehru Technological Univ., 1989; M.S., Arizona State Univ., 1991; Ph.D., Texas A & M Univ., 1995.

ELGART, Alexander (2007), Asst. Prof. of Mathematics. B.S., Technion, Israel 1998; Ph.D., Technion, Israel, 2000.

ELGERT, Klaus D. (1974), Prof. of Immunology. B.S., Evangel, 1970; Ph.D., Univ. of Missouri, 1973.

ELLER, John F., III (2006), Asst. Prof. of Education. B.S., Iowa State Univ., 1981; M.S., Univ. of Nebraska-Omaha, 1987; Ph.D., Loyola Univ.-Chicago, 2004. (National Capital Region)

ELLERBROCK, Michael J. (1992), Prof. of Agricultural and Applied Economics. B.S., Texas A&M, 1974; M.R.P.A., Clemson, 1975; Ph.D., Clemson, 1980.[2,4]

ELLINGSON, Steven (2003), Assoc. Prof. of Electrical and Computer Engineering. B.S., Clarkson, 1987; M.S., Ohio State, 1989; Ph.D., Ohio State, 2000.

ELLIS, Kimberly P. (1996), Assoc. Prof. of Industrial and Systems Engineering. B.S., Univ. of Tennessee, 1986; M.S., Univ. of Tennessee, 1990; Ph.D., Georgia Institute of Technology, 1996. [4]

ELLIS, Michael W. (1996), Assoc. Prof. of Mechanical Engineering. B.S., Univ. of Tennessee, 1985; M.S., Georgia Tech, 1993; Ph.D., Georgia Tech, 1996.

ELTOWEISSY, Mohamed Y. (2003), Assoc. Prof. of Electrical and Computer Engineering. B.S., Alexandria Univ., 1986; M.S., Alexandria Univ., 1989; Ph.D., Old Dominion Univ., 1993.

ELVINGER, Francois (1997), Prof. of Large Animal Clinical Sciences. Vet., Hannover Veterinary School, Germany,1981; Dr. Med. Vet., Hannover Veterinary School, 1983; Ph.D., Florida, 1990; Diplomate, A.C.V.P.M.

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EMMONS, Paul (1998), Assoc. Prof. of Architecture. M. Arch., Univ. of Minnesota, 1984; B.S., Univ. of Wisconsin-Eau Claire, 1979; Ph.D., Univ. of Pennsylvania, 2003.

ENG, Ludeman A. (1981), Assoc. Prof. of Biomedical Sciences and Pathobiology and Asst. Dean of Strategic Innovations. B.A., Rutgers, 1970; M.A., Virginia, 1973; Ph.D., Virginia, 1978.[8]

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FINNEY, Jack W. (1987), Prof. of Psychology and Assoc. Dean for Administrative and Faculty Affairs, College of Science. B.A., West Virginia Univ., 1976; M.A., West Virginia Univ., 1978; M.A., Univ. of Kansas, 1981; Ph.D., Univ. of Kansas, 1983.

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FITZPATRICK, William J. (1999), Assoc. Prof. of Philosophy. A.B., Princeton, 1986; M.A., UCLA, 1988; Ph.D., UCLA, 1995.

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FOWLER, Virginia C. (1977), Prof. of English. B.A., Univ. of Kentucky, 1969; M.A., Univ. of Pittsburgh, 1971; Ph.D., Univ. of Pittsburgh, 1976.

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FRAKES, William B. (1992), Assoc. Prof. of Computer Science. B.A., Univ. of Louisville, 1978; M.S., Univ. of Illinois at Champaign-Urbana, 1979; M.S., Syracuse, 1982; Ph.D., Syracuse, 1982. (Northern Virginia Center).

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FRASER, James D. (1981), Prof. of Wildlife Management. B.S., Idaho, 1974; M.S., Minnesota, 1978; Ph.D., Minnesota, 1981.

FRAZIER, Charles E. (1992), Thomas M. Brooks Prof. of Wood Science and Forest Products. B.S., Virginia Tech, 1985; M.S., Washington, 1987; Ph.D., Virginia Tech, 1992.

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FREEMAN, Larry E. (1978), Assoc. Prof. of Biomedical Sciences & Pathobiology. B.S., Wake Forest, 1970; D.V.M., Oklahoma State, 1974; M.S., Oklahoma State, 1977.

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FRIMPONG, Emmanuel (2007), Asst. Prof. of Fisheries Science. B.S., Univ. of Science & Technology, Ghana, 1997; M.S., Univ. of Arkansas, 2001; Ph. D., Purdue Univ., 2005.

FRISARD, Madlyn I. (2006), Asst. Prof. of Human Nutrition, Foods and Exercise. B.S., Louisiana State Univ., 1997; M.S., Louisiana State Univ., 1999; Ph.D., Louisiana State Univ., 2005.

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GABLER, H. Clay (2005), Assoc. Prof. of Biomedical Engineering. B.S., UVA, 1976; M.E., UVA, 1980; M.A., Princeton Univ., 1994; Ph.D., Princeton Univ., 1998.

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GRISSO, Robert D. (2001), Prof. of Biological Systems Engineering. B.S. Virginia Tech, 1978; M.S., Virginia Tech, 1980; Ph.D., Auburn Univ., 1985; P. E.

GRIZZARD, Thomas J. (1974), Prof. of Civil and Environmental Engineering. B.S., Virginia Tech, 1968; M.S., Virginia Tech, 1972; Ph.D., Virginia Tech, 1977; P.E. (Nat. Capital Region campus)

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GROSSMAN, Lawrence S. (1979), Prof. of Geography. B.A., Penn State, 1970; M.A., Minnesota, 1974; Ph.D., Australian National, 1979.

GRUBER, Nancy (1992), Asst. Director, Finance and Human Resource Administration, Outreach Program Development. B.S., Virginia Tech, 1988.

GUDMESTAD, Aarnes (2008), Asst. Prof. of Spanish. B.A., Concordia College, 2002; M.A., Indiana Univ., 2004; Ph.D., Indiana Univ., 2008.

GUÉYE, Médoune (2000), Assoc. Prof. of French and Francophone Studies. Licence és Lettres, U. of Dakar, Senegal, 1985; M.A., Cincinnati, 1985; Ph. D., Cincinnati, 1994.

GUGERCIN, Serkan (2003), Assoc. Prof. of Mathematics. B.S., Middle East Technical Univ., Ankara, Turkey, 1997; M.S., Rice Univ., 1999; Ph.D., Rice Univ., 2002.

GUIDO, Louis J. (1999), Assoc. Prof. of Electrical and Computer Engineering and Materials Science and Engineering . B.S.E.E., Polytechnic Institute of New York, 1982; M.S.E.E., Univ. of Illinois, 1983; Ph.D., Univ. of Illinois, 1989.

GUILBAUD, Patrick (2007), Program Director, IT in International Education. B.S., B.A., Univ. of Florida, 1986; M.B.A., Univ. of Virginia, 1995; M.S., Univ. of Virginia, 2003; Ph.D., Univ. of Virginia, 2007.

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Faculty & Administrators: H I J K

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

H

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JUNG, Sungwan (2009), Asst. Prof. of Engineering Science and Mechanics. B.S., Sogang Univ. (South Korea), 1999; M.S., POSTECH (South Korea); Ph.D., Univ. of Texas at Austin, 2005.

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K

KADLEC, Gregory B. (1992), R.B. Pamplin Professor of Finance. B.S., Purdue, 1985; M.S., Purdue 1986; Ph.D., Purdue, 1992.

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KRAIGE, Luther G. (1975), Prof. of Engineering Science and Mechanics. B.S., UVa., 1970; M.S., UVa., 1971; Ph.D., UVa., 1975.[2,3,4,9]

KRALLMAN, John D. (1985), Assoc. Director Information Technology Business Analysis. B.A., Univ. of Pittsburgh, 1979; MBA, Univ. of Pittsburgh, 1980.

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KUMAR, Raman (1984), R.V. and A.F. Oliver Prof. of Investment Management and Department Head. B.B.M., Banaras Hindu, 1974; M.B.A., Indian Institute of Management, 1977; Ph.D., Pittsburgh, 1985.

KURDILA, Andrew J. (2005), W. Martin Johnson Prof. of Mechanical Engineering. B.S., Univ. of Cincinnati, 1983; M.S., Univ. of Texas, Austin, 1984; Ph.D., Georgia Institute of Technology, 1988.

KUYPERS, Jim A. (2005), Assoc. Prof. of Communication, B.S., Florida State Univ., 1987; M.A., Florida State Univ., 1991; Ph.D., Louisiana State Univ., 1995.

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Faculty & Administrators: L M N O P Q R

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

L

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N

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RUOHONIEMI, John M. (2008), Assoc. Prof. of Electrical and Computer Engineering. B.A., B.Sc., Univ. of Dalhousie & The Univ. of Kings College, Nova Scotia, 1981; Ph.D., Univ. of Western Ontario, 1986.

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Faculty & Administrators: S T U V W X Y Z

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

- The numbers in parentheses indicate the year of joining the faculty. Job title, degrees earned, where obtained, and year obtained follow.
- Non-resident staff locations are noted for those persons not based at the Blacksburg campus.

S

SAFAAI-JAZI, Ahmad (1986), Prof. of Electrical and Computer Engineering. B.Sc., Tehran Univ. of Technology, 1971; M.A.Sc., Univ. of British Columbia, 1974; Ph.D., McGill, 1978.

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SAFFLE, Michael B. (1978), Prof. of Humanities. B.M., B.A., Univ. of Utah, 1968; A.M., Boston Univ., 1970; M.T.S., Harvard Univ., 1971; Ph.D., Stanford Univ., 1977.

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SCALLORNS, Joseph (2007), Instructor of English. B.A., Univ. of Missouri-Columbia, 1992; M.A., California State Univ., 2000; M.F.A., Louisiana State Univ., 2004.

SCAROLA, Vito W. (2009), Asst. Prof. of Physics. B.A., Boston Univ., 1997; Ph.D., Pennsylvania State Univ., 2002.

SCARPA, Angela (1997), Assoc. Prof. of Psychology. B.S., Saint Peters College, 1988; M.A., Univ. of Southern California, 1990; Ph.D., Univ. of Southern California, 1993.

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SCHETZ, Joseph A. (1969), Fred D. Durham Prof. of Aerospace and Ocean Engineering. B.S., Webb Institute of Naval Architecture, 1958; M.S.E., Princeton, 1960; M.A., Princeton, 1961; Ph.D., Princeton, 1962.

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U

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WINKEL, Brenda S.J. (1992), Prof. of Molecular Biology. B.S., Southern Illinois Univ., 1978; M.S., Southern Illinois Univ., 1981; Ph.D., Univ. of Georgia, 1989.

WINSTON, David R. (1998), Lecturer, Youth. B.S., Virginia Tech, 1987; M.S., Virginia Tech, 1998.

WISDOM, Harold W. (1976), Prof. Emeritus of Forest Economics. B.S., Idaho, 1960; M.S., N.Y. State Coll. of Forestry, 1964; Ph.D., N.Y. State Coll.

of Forestry, 1967.

WISEMAN, Philip E. (2005), Asst. Prof. of Forestry. B.S., Virginia Tech, 1996; M.S., Virginia Tech, 2001; Ph.D. Clemson Univ., 2005.

WISNIOSKI, Matthew H. (2007), Asst. Prof. of Science and Technology in Society. B.S., The Johns Hopkins Univ., 2000; M.A., Princeton Univ., 2002; Ph.D., Princeton Univ., 2005.

WITONSKY, Sharon (2000), Assoc. Prof. of Large Animal Clinical Sciences. B.A., Earlham, 1988; D.V.M., Minnesota, 1993; Ph.D., Tennessee, 1997; Diplomate, A.C.V.I.M.

WOKUTCH, Richard E. (1977), Pamplin Prof. of Management. B.S., Pittsburgh, 1972; Ph.D., Pittsburgh, 1977.

WOLF, James F. (1978), Prof. of Public Administration and Policy. B.A., LaSalle, 1965; M.P.A., Cornell, 1969; D.P.A., So. California, 1977. (Northern Virginia Center).

WOLF, Lynn Ann (2008), Curriculum Director, Child Development Center and Instructor of Human Development. B.S., Virginia Tech, 1998; M.A.Ed., Virginia Tech, 2000.

WOLF, Tony K. (1986), Prof. of Horticulture and Director of AHS, Jr. Agric. Research & Extension Center. B.S., West Virginia Univ., 1979; M.S., Penn State, 1982; Ph.D., Cornell, 1986. (Alson H. Smith, Jr. Agricultural Research & Extension Center).

WOLFE, Mary Leigh (1992), Prof. of Biological Systems Engineering. B.S., Virginia Tech, 1979; M.S., Virginia Tech, 1982; Ph.D., Minnesota, 1986.

WONG, Eric A. (1990), John W. Hancock, Jr. Prof. of Animal and Poultry Sciences. B.S., MIT - Cambridge, 1976; Ph.D., UC-San Diego, 1981.

WOOD, Cynthia M. (1986), Assoc. Prof. of Animal and Poultry Sciences. B.S., Florida, 1979; M.S., Mississippi State, 1982; Ph.D., Iowa State, 1986.

WOOD, Lynette I. (2004), Asst. Prof. of Accounting and Information Systems. B.S., Oakwood College, 1993; M.S., Alabama-Huntsville, 1995; M.B., Indiana, 1998; Ph.D., Indiana, 2003.

WOODALL, William H. (2000), Prof. of Statistics. M.S., Millsaps College, 1972; Ph.D., Virginia Tech,1980.

WOODARD, Linda S. (1980), Asst. Vice President for Administrative Services and Chief of Staff. B.A., College of William and Mary, 1970; M.A., Radford, 1971; M.S., Colorado State Univ., 1980.

WOOLSEY, Craig A. (2001), Assoc. Prof. of Aerospace and Ocean Engineering. B.ME., Georgia Inst. of Tech., 1995; M.A., Princeton Univ., 1997; Ph. D., Princeton Univ., 2000.

WORLEY, Gary M. (1978). Director, Digital Imaging. Adjunct Prof., Department of Teaching and Learning. B.A., Virginia Tech, 1978; M.A., Virginia Tech, 1994; Ph.D., Virginia Tech, 1999.

WRIGHT, Robert D. (1973), Prof. of Horticulture. B.S., Tennessee, 1965; M.S., Tennessee, 1968; Ph.D., Purdue, 1971.

WUBAH, Daniel A. (2009), Vice President and Dean for Undergraduate Education. B.Ed., Univ. of Cape Coast, Ghana, 1984; B.Sc. (Hons.), Univ. of Cape Coast, Ghana, 1984; M.S., Univ. of Akron, 1987; Ph.D., Univ. of Georgia, 1990.

WYATT, Christopher L. (2002), Assoc. Prof. of Electrical and Computer Engineering. B.S., Univ. of North Carolina at Charlotte, 1997; Ph.D., Wake Forest Univ. School of Medicine, 2002.

WYNN, Teresa M. (2004), Asst. Prof. of Biological Systems Engineering. B.S., Virginia Tech, 1992; M.S., North Carolina State Univ., 1995; Ph.D., Virginia Tech, 2004.

WYNNE, Randolph H. (1996), Assoc. Prof. of Forestry. B.S., North Carolina-Chapel Hill, 1986; M.S., Wisconsin-Madison, 1993; Ph.D., Wisconsin-Madison, 1995.

TOP

X

XIAO, Shuhai (2003), Prof. of Geobiology. B.Sc., Beijing Univ., 1988; M.Sc., Beijing Univ., 1991; A.M., Harvard, 1996; Ph.D., Harvard Univ., 1998.

XU, Yong (2004). Asst. Prof. of Electrical and Computer Engineering. B.S., Applied Physics, Tsinghua, 1995; Ph.D., Physics, California Institute of Technology, 2001.

XUAN, Jianhua (2006), Assoc. Prof. of Electrical and Computer Engineering, B.S., Univ. of Zhejiang, 1985; M.S., Univ. of Zhejiang, 1988; Ph.D., Univ. of Zhejiang, 1991; Ph.D., Univ. of Maryland, 1997.

TOP

Y

YANG, Dennis T. (2001), Prof. of Economics. B.A., Univ. of California, Los Angeles, 1987; M.A., Univ. of Chicago, 1989; Ph.D., Univ. of Chicago, 1994.

YANG, Yaling (2006), Asst. Prof. of Electrical and Computer Engineering. B.S., Univ. of Electronic Science and Technology of China, 1999; Ph.D., Univ. of Illinois, 2006.

YANG, Zhaomin (2002), Assoc. Prof. of Microbiology. B.Sc., Peking Univ. 1985; M.Sc. Univ. of California, Davis, 1993; Ph.D., Univ. of California, Davis, 1996.

YARDLEY, James A. (1986), Assoc. Prof. of Accounting and Information Systems. B.A., Brown, 1968; M.Ed., Lincoln, 1975; M.B.A., Western Illinois, 1980; Ph.D., Illinois, 1986.

YAU, Jeffrey (2005), Asst. Prof. of Economics. B.A. and B.S., UCLA, 2000; A.M., Univ. of Pennsylvania, 2002; Ph.D. Univ. of Pennsylvania, 2005.

YEE, Gordon T. (2001), Assoc. Prof. of Chemistry. B.S., Univ. of California (Berkeley), 1983; Ph.D., Stanford, 1990.

YODER, Keith S. (1976), Prof. of Plant Pathology. B.A., Goshen, 1968; M.S., Michigan State Univ., 1972; Ph.D., Michigan State Univ., 1974 (Alson H. Smith Agricultural Research and Extension Center).

YOON, Roe-Hoan (1978), ESM Affiliate Faculty, Nicholas T. Camicia Prof. of Mining and Minerals Engineering. B.S., Seoul National Univ., 1967; M. S., McGill Univ., 1971; Ph.D., McGill Univ., 1977.

YOU, Wen (2006), Asst. Prof. of Agricultural and Applied Economics. B.A., Nankai Univ., 2000; Ph.D., Texas A&M Univ., 2005.

YOUNG, Anne L. (1995), Asst. Director, Alumni Relations. B.S., Virginia Tech, 1989; M.A., Virginia Tech, 1995.

YOUNG, Deborah E. (2007), Asst. Prof. of Civil and Environmental Engineering. B.S., Virginia Tech, 1996; M.S., North Carolina State Univ.; M.S., Virginia Tech, 2006; Ph.D., Virginia Tech, 2007.

YOUNG, Denise (2007), Instructor of Communication. B.S., Radford Univ., 1989; M.S., Radford Univ., 1993.

YOUNG, Philip E. (2006), Instructor; Library. B.A., Univ. of Tennessee, 1991; M.S.I.S., Univ. of Tennessee, 2006.

YOUNGMAN, Roger R. (1988), Prof. of Entomology. B.A., California State Univ., Fullerton, 1978; Ph.D., UC-Riverside, 1984.

YUAN, Lijuan (2007), Asst. Prof. of Biomedical Sciences and Pathobiology. M.S., Peking Union Medical College, 1991; Ph.D., Ohio State Univ., 2000.

YUAN, Rongcai (2005), Asst. Prof. of Horticulture. B.S. Jiangxi Agricultural Univ., 1984; M.S. South China Agricultural Univ., 1987; Ph.D. Univ. of Massachusetts, 1998. (Alson H. Smith, Jr. Agricultural Research & Extension Center).

YUE, Pengtao (2008), Asst. Prof. of Mathematics. B.S., Univ. of Science and Technology of China, 1997; Ph.D., Univ. of Sciences and Technology of China, 2002.

TOP

Z

ZAHM, Diane L. (1995), Assoc. Prof. of Urban Affairs and Planning. B.S., Allegheny College, 1980; M.P., Univ. of Virginia, 1982; Ph.D., SUNY, 1986.[8]

ZAJAC, Anne M. (1986), Assoc. Prof. of Biomedical Sciences and Pathobiology. B.S., Michigan, 1973; M.S., Michigan State, 1979; D.V.M., Michigan State, 1982; Ph.D., Ohio State, 1986.

ZALDIVAR, Marc R. (2008), Electronic Portfolio Project Manager. B.A., Virginia Tech, 1991; M.A., Virginia Tech, 1993.

ZALLEN, Doris T. (1983), Prof. of Science and Technology in Society. B.S., Brooklyn College, 1961; M.A., Harvard, 1963; Ph.D., Harvard, 1966.[9]

ZANOTTI, Laura (2006), Assoc. Prof. of Political Science. B.A., Univ. of Pavia, 1985; M.B.A., SCA Bocconi, 1988; Ph.D., Florida International Univ., 2004.

ZAWISTOWSKI, Marie (2008), Visiting Asst. Prof. of Architecture. M.Arch., Ecole d'Architecture, Paris, Malaquais., 2004.

ZEDAKER, Shepard M. (1981), Prof. of Forest Ecology, Silviculture and Weed Science. B.S., Humboldt State, 1975; M.S., Purdue, 1977; Ph.D., Oregon State, 1981.

ZEMACK-RUGAR, Yael (2006), Asst. Prof. of Marketing. B.A., Tel-Aviv Univ., Israel, 1997; M.B.A., Univ. of Rochester, 2000; Ph.D., Duke Univ., 2006.

ZHANG, Chenming (2001), Assoc. Prof. of Biological Systems Engineering. B.S., Univ. of Science and Technology, China, 1986; M.S., Univ. of Science and Technology, China, 1991; M.S., Iowa State, 1996; Ph.D. Iowa State, 1999.

ZHANG, Liqing (2004), Asst. Prof. of Computer Science. B.S., Lanzhou University, 1997; Ph.D., University of California, 2002.

ZHANG, Yi-Heng Percival (2005), Asst. Prof. of Biological Systems Engineering. B.E., East China Univ. of Science and Technology, 1993; M.S., East China Univ. of Science and Technology, 1996; Ph.D., Dartmouth, 2002.

ZHAO, Bingyu (2007), Asst. Prof. of Horticulture. B.S., Shan Dong, P.R. China, 1994; M.S., Beijing, P.R. China, 1997; Ph.D., Kansas State Univ., 2004.

ZHOU, Kequan "Kevin", (2006), Asst. Prof., Food Science and Technology. M.D., Shandong Univ. Medical School, 1998; M.S., Chinese Center for Disease Control and Prevention 2001; Ph.D., Univ. of Maryland, 2005.

ZHOU, Ying, (2006), Asst. Prof. of Geophysics. B.S., Zhejiang Univ., China, 1996; M.S., Chinese Academy of Sciences, 1999; M.A., Princeton Univ., 2001; Ph.D., Princeton Univ., 2004.

ZHU, Jinsong (2007), Asst. Prof. of Biochemistry. B.Sc., Wuhan Univ., 1989; Ph.D., Shanghai Institute of Plant Physiology, Chinese Academy of Sciences, 1994.

ZIA, Royce K. P. (1976), Prof. of Physics. A.B., Princeton, 1964; Ph.D., MIT, 1968.[2]

ZIETSMAN, Lizette (2005). Asst. Prof. of Mathematics. B.S., Univ. of Pretoria, 1990; M.S., Univ. of Pretoria, 1992; Ph.D., Univ. of Pretoria, 2000.

ZIMMERMAN, Kurt (2004), Asst. Prof. of Biomedical Sciences and Pathobiology. D.V.M., Purdue, 1984; Ph.D., Virginia Tech, 2003; Diplomate, A.C.V.P.

ZINK-SHARP, Audrey (1992), Prof. of Wood Mechanics and Asst. Department Head. B.S., Colorado State, 1983; M.S., Colorado State, 1986; Ph.D., SUNY-ESF, Syracuse, 1992.

ZIPPER, Carl E. (1986), Assoc. Prof. of Crop and Soil Environmental Sciences. B.A., Lehigh Univ., 1970; B.S., Virginia Tech, 1978; M.S., Virginia Tech, 1987; Ph.D., Virginia Tech, 1986.

ZOBEL, Christopher W. (1998), Assoc. Prof. of Business Information Technology. B.A., Colgate Univ., 1991; M.S., Univ. of North Carolina at Chapel Hill, 1993; Ph.D., UVa., 1998.

ZOECKLEIN, Bruce W. (1995), Prof., Food Science and Technology. B.S., California State Univ. at San Diego, 1968; M.S., Virginia Tech, 1993; Ph.D., Virginia Tech, 1995.[5]

ZUCHOWSKI, Allison H. (1993), Asst. Director of Recreational Sports. B.A., East Carolina Univ.,1992; M.S., Radford, 1994 & 1997.

TOP

Faculty Emeriti

A-B | C-D | E-G | H-K | L-R | S-Z | Emeriti | Honors

- Emeriti are retired personnel of rank above Assistant Professor.
- The dates in parentheses indicate the date of original employment and the date of retirement (in a few cases the dates are not consecutive).

Footnotes used:

[1] Award for Excellence in Undergraduate Advising
[2] Academy of Teaching Excellence inductee
[3] Wine Award recipient
[4] Sporn Award recipient
[5] Alumni Award for Extension Excellence
[6] Alumni Award for Research Excellence
[7] Alumni Award for Teaching Excellence
[8] Academy of Faculty Service
[9] Commonwealth of Virginia Outstanding Faculty Award
[10] Diggs Teaching Scholar Awards

ABASHIAN, Alexander, Ph.D., *Professor Emeritus of Physics,* (1980-97).
ACKERMAN, Clemens J., Ph.D., *Professor Emeritus of Biochemistry and Nutrition,* (1955-80).
ACUFF, Earl C., M.A., *Commandant of Cadets Emeritus,* (1970-80).
ADAMS, Robert E., Ph.D., *Associate Professor Emeritus of Forestry,* (1962-91).
ADKISSON, Curtis S., Ph.D., *Associate Professor Emeritus of Biology*, (1971-01).
ALEXANDER, Larry D., Ph.D., *Associate Professor Emeritus of Management*, (1981-2008).
ALEXANDER, Michael D., Ph.D., *Associate Professor Emeritus of History*, (1967-01).
ALLEN, George Andrew, Jr., M.S., *Professor Emeritus of Animal Science*, (1947-81).
ALLEN, Louis B., M.S., *Associate Professor Emeritus of Animal Science*, (1955-89).
ALLEN, William A., Ph.D., *Professor Emeritus of Virginia Cooperative Extension,* (1968-95).
ALLISON, Allen H., *Associate Professor Emeritus, Extension,* (1958-88).
ALLISON, Donald C. S., Ph.D., *Professor Emeritus of Computer Science,* (1979-02).
ALLISON, Llewellyn S., *Senior Extension Agent Emerita*, (1972-02).
AMOS, Dan F., Ph.D., *Associate Professor Emeritus of Crop and Soil Environmental Sciences,* (1961-90).
AMOS, John Madison, M.S.A., *Associate Professor Emeritus of Entomology,* (1949-70).
ANDERSON, Bruce M., Ph.D., *Professor Emeritus of Biochemistry,* (1970-98).
ANDERSON, Larz T., M.C.R.P., *Associate Professor Emeritus of Urban Affairs and Planning,* (1977-89).
ANDERSON, Robert R., Ph.D., *Associate Professor Emeritus of German,* (1968-93).
ANDREWS, Robin M., Ph.D., *Professor Emerita of Biological Sciences,* (1976-09).
ARMSTRONG, James R., Ph.D., *Professor Emeritus of Electrical and Computer Engineering,* (1975-05).
ARNDT, Richard A., Ph.D., *Professor Emeritus of Physics,* (1967-96).
ARNOLD, Jesse C., Ph.D., *Professor Emeritus of Statistics*, (1968-02).
ARNOLD, Jimmy T., Ph.D., *Professor Emeritus of Mathematics,* (1969-04). [2, 7]
ARP, Leon J., Ph.D., *Professor Emeritus of Mechanical Engineering,* (1966-91).
ASCHE, F. Marion, Ph.D., *Professor Emerita of Education*, (1976-98).
AUCHEY, Flynn L., Ed.D., *Associate Professor Emeritus of Architecture,* (1995-08).
AULL, Charles E., Ph.D., *Professor Emeritus of Mathematics*, (1965-92).
AUSTIN, Edith A., *Senior Extension Agent Emerita*, (1981-02).
AXELSON, Leland J., Ph.D., *Professor Emeritus of Family and Child Development,* (1977-89).
BAKER, James C., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences,* (1978-2008).
BALDWIN, Robert E., Ph.D., *Professor Emeritus of Plant Pathology,* (1985-95).
BALLWEG, John A., Ph.D., *Professor Emeritus of Sociology*, (1976-00).
BAMBACH, Richard K., Ph.D., *Professor Emeritus of Geological Sciences*, (1970-00).
BAME, E. Allen, Ed.D., *Associate Professor Emeritus of Education*, (1974-02).
BANCO, Thomas J., Ph.D., *Associate Professor Emeritus of Horticulture,* (1979-2007).
BARCLAY, Nancy A., Ph.D., *Professor Emerita of Resource Management,* (1973-94).
BARDEN, John A., Ph.D., *Professor Emeritus of Horticulture*, (1963-02).
BARKER, Richard M., Ph.D., *Professor Emeritus of Civil and Environmental Engineering*, (1964-01).
BARNETT, Lewis B., Ph.D., *Associate Professor Emeritus of Biochemistry and Nutrition,* (1963-96).
BARNWELL, Richard W., Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering and Engineering Science and Mechanics*, (1995-05).
BARRETT, J. David, Ph.D., *Extension Director Emeritus*, (1973-03).
BARTON, Jo Anne, M.S., *Associate Professor Emerita of Human Nutrition and Foods,* (1963-91).
BASS, Carolyn R., *Senior Extension Agent Emerita*, (1972-02).
BATES, Robert C., Ph.D., *Professor of Biology and Dean Emeritus of the College of Arts and Sciences*, (1972-02).
BAUER, Henry H., Ph.D., *Professor Emeritus of Chemistry and Science Studies and Dean Emeritus of Arts and Sciences,* (1978-99).
BAYER, Alan E., Ph.D., *Professor of Sociology and Director Emeritus of the Center for Survey Research,* (1982-06).
BELL, E. Stephen Jr., M.S., *Associate Professor Emeritus of Agricultural Engineering,* (1958-91).
BELL, Harold M., Ph.D., *Associate Professor Emeritus of Chemistry*, (1966-98).
BELL, James Bailey, Ph.D., *Professor Emeritus of Agricultural Economics,* (1957-90).
BENOIT, Robert E., Ph.D., *Associate Professor Emeritus of Biology*, (1962-01).
BESIERIS, Ioannis M., Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1972-03).[2]
BINGHAM, Samuel W., Ph.D., *Professor Emeritus of Weed Science,* (1961-95).

BIRD, Monroe Murphy, Ph.D., *Professor Emeritus of Marketing*, (1968-02).
BISHOP, Lloyd O., Ph.D., *Professor Emeritus of French,* (1969-95).
BLACKWELL, William A. Ph.D., *Professor Emeritus of Electrical Engineering,* (1966-88).
BLANCHARD, Benjamin S., P.E., *Professor Emeritus of Industrial and Systems Engineering*, (1970-97).
BLIZNAKOV, Milka T., Ph.D., *Professor Emeritus of Architecture,* (1974-96).
BLOSS, F. Donald, Ph.D., *Alumni Distinguished Professor Emeritus of Mineralogy,* (1967-91).
BLUME, George T., Ph.D., *Professor Emeritus of Rural Sociology, Extension,* (1955-91).
BOISEN, Monte B., Jr., Ph.D., *Professor Emeritus of Mathematics*, 1970-01. [2, 3, 8]
BOONE, James Frederick, B.S., *Treasurer Emeritus,* (1952-81).
BORCHERS, Edward A., Ph.D., *Professor Emeritus, Extension,* (1985-92).
BOS, Ronald, Ph.D., *Professor Emeritus of Health, Physical Education and Recreation*, (1979-96).
BOWDEN, Robert L., Ph.D., *Professor Emeritus of Physics,* (1963-96).
BOWEN, John M., B.Vet.Med., *Professor Emeritus of Large Animal Clinical Sciences*, (1986-01).
BOWKER, Jeanette, E., Ed.D., *Associate Professor Emerita of Interior Design*, (1974-00).
BOYD, Earl Neal, Ph.D., *Professor Emeritus of Food Science and Technology,* (1968-88).
BRAGG, Denver Dayton, M.S., *Associate Professor Emeritus of Poultry Science,* (1949-73).
BRANN, Daniel E., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1974-02).
BRANT, William Lewis, Ph.D., *Professor Emeritus of Agricultural Economics,* (1974-81).
BRAATEN, Ellen Bussard, *Assistant Professor Emerita*, (1971-03).
BRICE, Luther Kennedy, Jr., Ph.D., *Professor Emeritus of Chemistry,* (1954-86).[2, 3]
BRODERICK, John J., Ph.D., *Professor Emeritus of Physics,* (1974-04).
BROOKS, Coy Clifton, Ph.D., *Professor Emeritus of Animal Science*, (1977-84).
BROWN, Gregory N., D.F., *Dean Emeritus of the College of Natural Resources,* (1992-04).
BROWN, Jesse J., Jr., *Professor Emeritus of Materials Science and Engineering*, (1966-99).
BROWN, Norman Loose, Ph.D., *Associate Professor Emeritus of Economics*, (1963-82).
BROWN, Weldon Amzy, Ph.D., *Professor Emeritus of History,* (1939-78).
BROWN, William W., M.C.P., *Professor Emeritus of Architecture*, (1974-03).
BRYANT, Clifton D., Ph.D., *Professor Emeritus of Sociology,* (1972-07).
BRYANT, Harry Talbot, Ph.D., *Associate Professor Emeritus of Agronomy,* (1955-87).
BUCHANAN, James M., Ph.D., *University Distinguished Professor Emeritus of Economics and Philosophy*, (1969-1983).
BUFFER, James J., Ed.D., *Horace G. Fralin Professor and Dean Emeritus of the College of Education,* (1990-97).
BUHYOFF, Gregory J., Ph.D., *Julian N. Cheatham Professor Emeritus of Forestry,* (1975-04).
BUNCE, George Edwin, Ph.D., *Professor Emeritus of Biochemistry and Nutrition,* (1965-95).
BURGER, James A., Ph.D., *Garland Gray Professor Emeritus of Forestry,* (1979-2008).
BURIAN, Richard M., Ph.D., *Professor Emeritus of Philosophy and Science and Technology Studies,* (1983-2007).
BURKE, Carl E., *Assistant Vice President Emeritus of Business Affairs*, (1965-91).
BURKE, Stanley R., Ph.D., *Associate Professor Emeritus of Agricultural and Extension Education*, (1985-02).
BURKETT, M. Sexton, Ph.D., *Associate Professor Emeritus, Cooperative Extension,* (1967-91).
BURKHART, Velda B., A.B.L.S., *Associate Professor Emerita, Library,* (1969-83).
BURR, Annette P., Ph.D., *Associate Professor Emerita, Library*, (1989-01).
BURR, David D., Ph.D., *Professor Emeritus of History*, (1966-01).
BURRUSS, Kathryn W., *Senior Extension Agent Emerita*, (1974-03).
BUSS, Glenn R., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1967-02).
BYERS, Ross E., Ph.D., *Professor Emeritus of Horticulture*, (1971-02).
CAIRNS, John, Jr., Ph.D., *University Distinguished Professor and Director Emeritus, (*1967-95)
CAMP, William G., Ph.D., *Professor Emeritus of Agricultural and Extension Education*, (1980-03).
CAMPBELL, Hilbert H., Ph.D., *Professor Emeritus of English,* (1967-97).
CAMPBELL, Hugh G., M.S., *Professor Emeritus of Mathematics*, (1955-92).
CANNELL, Robert Q., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1987-99).
CARLISLE, E. Fred, Ph.D., *William E. Lavery Professor & Senior Vice President and Provost Emeritus*, (1989-00).
CARRIG, Colin B., Ph.D., *Professor Emeritus of Small Animal Clinical Sciences*, (1980-07).
CARSON, Eugene W., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences,* (1966-96).
CARTER, C. Dean, M.F.A., *Professor Emeritus of Art and Art History*, (1950-92).
CARTER, Gordon R., D.VSc., *Professor Emeritus of Pathobiology,* (1981-86).
CARTER, John H., Jr., M.S., *Associate Professor Emeritus of Animal Science*, (1959-89).
CASTAGNOLI, Neal, Jr., Ph.D., *Harvey W. Peters Professor Emeritus of Chemistry*, (1988-05).
CHANDLER, R. Michael, Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1975-02).
CHAPPELL, William E., Ph.D., *Professor Emeritus of Plant Physiology,* (1951-82).
CHEN, Dan Y., Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1979-03).
CHIANG, Robert N.S., M. Arch., *Professor Emeritus of Architecture,* (1968-96).
CILEMBERG, Vincent J., M. Arch., *Associate Professor Emeritus of Building Construction,* (1976-95).
CLAUS, George William, Ph.D., *Associate Professor Emeritus of Microbiology,* (1973-02).[6]
CLAUS, Richard O., Ph.D., *Lewis A. Hester Professor Emeritus of Materials Science and Engineering and Professor Emeritus of Electrical and Computer Engineering,* (1977-2008) [4,6,9]
CLAYTON, Edward R., Ph.D., *Lenz Professor Emeritus of Management Science,* (1968-2008).
CLEMENS, Paul F., M.S., *Associate Professor Emeritus of Mathematics,* (1955-84).
CLIFF, Eugene M., Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering*, (1971-02).
CLIFFORD, Michael J., *Senior Extension Agent Emeritus,* (1971-02).
CLINE, Marvin G., Ph.D., *Professor Emeritus of Educational Leadership and Policy Studies*, (1977-02).
CLOUSE, James P., Ph.D., *Professor Emeritus of Education,* (1973-87).

CLOWES, Darrel A., Ph.D., *Associate Professor Emeritus of Education,* (1977-96).
COALE, Jr., Charles W., Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1969-02).
COARTNEY, James S., Ph.D., *Associate Professor Emeritus of Horticulture,* (1966-92).
COCHRAN, Donald G., *Professor Emeritus of Entomology,* (1957-95).
COLLINS, Eldridge R., Ph.D., *Professor Emeritus of Biological Systems Engineering*, (1971-00).
COLLINS, William H., M.S., *Associate Professor Emeritus of Biological Systems Engineering*, (1971-99).
COMPARIN, Robert A., Ph.D., *Professor Emeritus of Mechanical Engineering,* (1973-93).
CONFORTI, Frank D., Ph.D., *Associate Professor Emeritus of Human Nutrition, Foods and Exercise*, (1991-06).
CONGER, William L., Ph.D., *Professor Emeritus of Chemical Engineering*, (1983-02).[4]
CONNER, Charles W., *Senior Extension Agent Emeritus*, (1974-02).
CONNER, Maynard Calvin, Ph.D., *Professor Emeritus of Agricultural Economics,* (1945-58).
CONNERS, Richard W., Ph.D., *Associate Professor Emeritus of Electrical and Computer Engineering*, (1987-03).
COOK, Virgil A., Ph.D., *Associate Professor Emeritus of English*, (1963-02).
COOLER, Frederick W., Ph.D., *Associate Professor Emeritus of Food Science and Technology*, (1962-91).
COOPER, Charles R., Ph.D., *Associate Professor Emeritus of Animal Science*, (1959-89).
CORDES, Donald O., B.V.Sc., *Professor Emeritus of Veterinary Pathobiology*, (1981-97).
CORUH, Cahit, Ph.D., *Professor Emeritus of Geophysics,* (1979-04).
COSGRIFF, John C. Jr., M.S., Associate Professor Emeritus of the University Libraries, (1974-05).
COSTAIN, John K., Ph.D., *Professor Emeritus of Geophysics*, (1967-96).
COVEY, Thomas W. III, *Senior Extension Agent Emeritus,* (1978-05).
COWLES, Joe R., Ph.D., *Professor Emeritus of Biological Sciences,* (1990-2008).
COX, Ruby H., Ph.D., *Professor Emerita of Human Nutrition, Foods and Exercise,* (1989-06).
CRAIG, James R., Ph.D., *Professor Emeritus of Geological Sciences*, (1970-02). [2,4,9]
CRAIK, Susan E., *Senior Extension Agent Emerita*, (1975-02).
CRANFORD, Jack A., Ph.D., *Associate Professor Emeritus of Biological Sciences*, (1977-2008).
CRAWFORD, Helen J., Ph.D., Professor Emerita of Psychology, (1987-05).
CREAMER, Don G., Ed.D., *Professor Emeritus of Higher Education and Student Affairs,* (1977-05).
CROFTS, George W., Ph.D., Senior Associate Dean Emeritus in the College of Science, (1970-05).
CROSS, Gerald H., Ph.D., *Professor Emeritus of Fisheries and Wildlife Sciences*, (1973-00).
CROSS, Landrum L., Ed.D., *Vice President Emeritus for Student Affairs,* (1983-05).
CROSS, Lawrence H., Ph.D., *Professor Emeritus of Educational Leadership and Policy Studies*, (1974-02).
CRUNKILTON, John R., Ph.D., *Professor Emeritus of Agricultural and Extension Education*, (1969-03). [2,7]
CUMMINS, Cecil S., Sc.D., *Professor Emeritus of Microbiology,* (1967-89).
CURCIO, Claire Cole, Ph.D., *Professor Emerita of Educational Leadership and Policy Studies*, (1989-01).
CURRIE, Leonard J., *Professor Emeritus of Architecture,* (1996).
CURRY, Charles K., *Senior Extension Agent Emeritus*, (1976-02).
CYRE, Walling R., Ph.D., *Associate Professor Emeritus of Electrical and Computer Engineering,* (1989-05).
DANNER, David R., *Senior Extension Agent Emeritus*, (1969-02).
DAVIS, Agnes Marion, M.A.L.S., *Associate Professor Emerita, Library,* (1954-85).
DAWSON, Kenneth E., Ph.D., *Professor Emeritus, Cooperative Extension,* (1973-91).
DAY, Savannah S., Ph.D., *Professor Emerita of Housing, Interior Design, and Resource Management,* (1980-90).
DEISENROTH, Michael P., Ph.D., *Professor Emeritus of Industrial and Systems Engineering,* (1984-2007).
DENNISON, Brian K., Ph.D., *Professor Emeritus of Physics,* (1977-04).
DENSMORE, Barbara, Ph.D., *Professor Emerita of Clothing and Textiles,* (1978-89).
DeOMS, Gary C., Ph.D., *Senior Extension Agent Emeritus*, (1971-02).
DESSY, Raymond E., Ph.D., *Professor Emeritus of Chemistry*, (1966-92).
de Wolf, David A., Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1982-03). [8]
DICKEY, John W., Ph.D., *Professor Emeritus of Urban Affairs & Planning and Public Administration & Policy*, (1966-03).
DILLARD, John G., Ph.D., *Professor Emeritus of Chemistry,* (1967-2008).
DISTLER, Paul A., Ph.D., *Alumni Distinguished Professor Emeritus of Theatre Arts*, (1967-04). [3]
DIXON, Benjamin, Ed.D., *Vice President Emeritus for Multicultural Affairs,* (1998-06).
DODL, Norman R., Ed.D., *Professor Emeritus of Education,* (1976-96).
DOMERMUTH, Charles E., Ph.D., *Professor Emeritus of Large Animal Clinical Sciences*, (1954-92). [6]
DONOHUE, Stephen J., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1974-02).
DOSWALD, Herman K., Ph.D., *Professor Emeritus of Foreign Languages and Literatures and Dean Emeritus of the College of Arts and Sciences,* (1979-96).
DRAKE, Dana B., Ph.D., *Professor Emerita of Spanish,* (1967-87).
DREW, Donald R. Ph.D.,*Professor Emeritus of Civil and Environmental Engineering,* (1975-99).
DRAPEAU, Donald A., M.A.,*Professor Emeritus of Theatre Arts,* (1967-02).
DRISCOLL, Margaret L., Ed.D., *Professor Emerita of Education*, (1970-93).
DuBOSE, Robert Trafton, D.V.M., *Professor Emeritus of Veterinary Medicine,* (1959-82).[5]
DUDLEY, Charles Jack., Ph.D., *Professor Emeritus of Sociology and Director Emeritus of University Honors,* (1974-2008).
DUENK, Lester G., Ph.D., *Professor Emeritus of Vocational and Technical Education,* (1966-92).
DUERR, William A., Ph.D., *Thomas M. Brooks Professor Emeritus of Forestry,* (1972-78).
DUGGER, William E., Ph.D., *Professor Emeritus of Education,* (1972-97).
DUKE, George B., B.S., *Associate Professor Emeritus of Agricultural Engineering,* (1952-81).
DUKORE, Bernard F., Ph.D., *University Distinguished Professor Emeritus of Theater Arts,* (1986-97).
DUNCAN, J. Michael, Ph.D., *University Distinguished Professor Emeritus of Civil and Environmental Engineering,* (1984-07).
DUNFORD, James J., *Senior Extension Agent Emeritus*, (1975-01).
DURHAM, Wayne C., Ph.D., *Associate Professor Emeritus of Aerospace and Ocean Engineering,* (1989-04).

DYCK, Robert G., Ph.D., *Professor Emeritus of Urban Affairs and Planning*, (1970-01).
DYER, Delwyn A., Ph.D., *Professor and Director Emeritus, Volunteer Development, Public Service,* (1968-91).
EARP, Unus Fuller, M.S., *Professor Emeritus of Agricultural Engineering,* (1939-77).
EARTHMAN, Glen I., Ed.D., *Associate Professor Emeritus of Educational Administration,* (1974-96).
EATON, John L., Ph.D., *Professor Emeritus of Entomology & Associate Dean Emeritus of the Graduate School*, (1969-01).
EBEL, Richard E., Ph.D., *Associate Professor Emeritus of Biochemistry*, (1977-02).
EDMONDS, William J., Ph.D., *Associate Professor Emeritus of Crop and Soil Environmental Sciences,* (1962-99).
EDWARDS, John N., Ph.D., *Professor Emeritus of Sociology*, (1967-99).
EDWARDS, Patricia Klobus, Ph.D., *Professor Emerita of Urban Affairs and Planning and Dean Emerita of the College of Architecture and Urban Studies*, (1974-99).
EHRENTHAL, Frank F., D. diArch., *Professor Emeritus of Environmental and Urban Systems,* (1968-80).
EISLER, Richard M., Ph.D., *Professor Emeritus of Psychology*, (1977-02).
EISS, Norman S., Ph.D., *Professor Emeritus of Mechanical Engineering*, (1966-98).
ELLER, Arthur L. Jr., Ph.D., *Professor Emeritus of Animal Science,* (1960-92).5
ERICKSEN, E. Gordon, Ph.D., *Professor Emeritus of Sociology,* (1966-82).
ESCHENMANN, K. Kurt, Ed.D., *Professor Emeritus of Teaching and Learning*, (1976-03).
ESEN, Asim, Ph.D., *Professor Emeritus of Biological Sciences,* (1975-2008).
ESSARY, Eskel Oren, Ph.D., *Professor Emeritus of Food Science and Technology,* (1955-82).
EUSTIS, J. Christopher, Ph.D., *Associate Professor Emeritus of Spanish and Portuguese,* ((1976-99). [2]
EUSTIS, Joanne, B.S., *Assistant Professor and Director Emerita of Planning for Information Systems,* (1976-99).
EVANS, Edward B., B.S., *Director Emeritus of Insurance and Fixed Asset Management,* (1955-85).
EYRE, Peter, Ph.D., *Professor and Dean Emeritus of Veterinary Medicine,* (1985-07).
FABRYCKY, Wolter J., Ph.D., *John L. Lawrence Professor Emeritus of Industrial and Systems Engineering,* (1965-95).
FAISZT, James A., M.L.A., *Associate Professor Emeritus of Horticulture,* (1963-88).
FARISS, S. Joe, *Senior Extension Agent Emeritus*, (1971-02).
FARKAS, Daniel R., Ph.D., *Professor Emeritus of Mathematics,* (1975-06).
FARQUHAR, Sue W., Ph.D., *Associate Professor Emerita of Foreign Languages and Literatures,* (1989-2008).
FERN, Edward F., Ph.D., *Professor Emeritus of Marketing,* (1981-2007).
FICENEC, John R., Ph.D., *Professor Emeritus of Physics*, (1968-04).
FIELD, Paul E., Ph.D., *Associate Professor Emeritus of Chemistry*, (1963-99).
FINCH, Curtis R., Ed.D., *Professor Emeritus of Career and Technical Education*, (1974-02).
FISHER, Robert Anderson, Ph.D., *Professor Emeritus of Chemical Engineering,* (1936-65).
FLEMING, Daniel B. Jr., Ed.D., *Professor Emeritus of Education,* (1970-92).
FLETCHER, Peter, Ph.D., *Professor Emeritus of Mathematics,* (1966-92).
FONTENOT, Joseph P., Ph.D., *John W. Hancock Jr. Professor Emeritus of Animal and Poultry Sciences,* (1956-04).[6]
FORD, David R., Ph.D., *Vice President and Dean Emeritus for Undergraduate Education,* (1998-2008).
FOREMAN, William E., Ph.D., *Associate Professor Emeritus of Mining and Minerals Engineering,* (1957-89).
FORKNER, Henry R., M.S., *Associate Professor Emeritus of Materials Engineering,* (1948-88).
FORTUNE, Jimmie C., Ph.D., *Professor Emeritus of Educational Leadership and Policy Studies*, (1973-01).
FOUTZ, Robert V., Ph.D., *Professor Emeritus of Statistics*, (1975-02).
FOY, Chester L., Ph.D., *Professor Emeritus of Plant Pathology, Physiology and Weed Science*, (1966-02).
FRANCHINA, Joseph J., Ph.D., *Professor Emeritus of Psychology*, (1969-02).
FRANKLIN, H. Bland Jr., M.S., *Associate Professor Emeritus, Community Development, Public Service,* (1966-91).
FRARY, Robert B., Ph.D., *Professor Emeritus of Educational Measurement and Research*, (1971-96).
FREDERICK, Daniel, Ph.D., *Alumni Distinguished Professor Emeritus of Engineering Science and Mechanics*, (1948-92).
FREGIN, G. Frederick, V.M.D., *Professor Emeritus of Large Animal Clinical Sciences*, (1983-03).
FRIEND, Edith, *Assistant Professor Emerita, Virginia Cooperative Extension Service.*
FULLER, Amelia Hopkins, M.S., *Professor Emerita of Management, Housing, and Family Development,* (1942-68).
FULLER, Landon Edward, Ph.D., *Professor Emeritus of English,* (1928-67).
FUREY, Michael J., Ph.D., *Professor Emeritus of Mechanical Engineering,* (1968-05).
FURR, A. Keith, Ph.D., *Professor Emeritus of Nuclear Engineering,* (1960-94).
GAINES, James Abner, Ph.D., *Associate Professor Emeritus of Animal Science*, (1956-89).
GARDNER, David L., *Senior Extension Agent Emeritus*, (1977-02).
GARMAN, E. Thomas, Ed.D., *Professor Emeritus of Near Environments*, (1975-00).
GARREN, Kenneth Howard, Ph.D., *Professor Emeritus of Chemistry*, (1955-81).
GARST, Donald A., P.E., *Professor Emeritus of Civil Engineering,* (1961-96).
GATEWOOD, Thomas E., Ed.D., *Associate Professor Emeritus of Secondary Education,* (1980-06).
GERKEN, H. John Jr., Ph.D., *Professor Emeritus of Animal Science*, (1954-91).
GERKEN, Shirley H., Ed.D., *Associate Professor Emerita of Public Service,* (1978-97).
GETZ, Hilda M., Ed.D., *Associate Professor Emerita of Counselor Education,* (1996-06).
GHARE, Prabhakar M., Ph.D., *Associate Professor Emeritus of Industrial Engineering and Operations Research,* (1966-91).
GIEGOLD, William C., Ph.D., *Professor Emeritus of Business Extension,* (1972-83).
GILES, Robert H., Jr., Ph.D., *Professor Emeritus of Wildlife Resource Management*, (1968-98).
GILMER, Thomas J., Ph.D., *Professor Emeritus of Physics,* (1958-89).
GLANVILLE, James O., Ph.D., *Associate Professor Emeritus of Chemistry,* (1986-04). [4]
GLASSER, Wolfgang, G., Ph.D., *Professor Emeritus of Wood Science and Forest Products*, (1972-02).
GOOD, Charles M., Jr., Ph.D., *Professor Emeritus of Geography*, (1972-02).
GOOD, Irving J., Ph.D., *University Distinguished Professor Emeritus of Statistics,* (1967-94).
GOODSELL, Charles T., Ph.D., *Professor Emeritus of Public Administration*, (1978-02).
GORMSEN, Svend T., Ph.D., *Professor Emeritus of Mathematics*, (1956-69).
GOTOW, Kazuo, Ph.D., *Professor Emeritus of Physics,* (1964-96).

GRAEFF, Robert F., M.A., *Associate Professor Emeritus of Architecture*, (1978-99).
GRAF, Gottfried C., Ph.D., *Professor Emeritus of Dairy Science,* (1945-74).
GRAHAM, Paul P., Ph.D., *Associate Professor Emeritus of Food Science and Technology*, (1958-02).
GRAHAM, Richard "Terry", Ph.D., *Associate Professor Emeritus of Teaching and Learning*, (1971-03).
GRAY, Caryl E., M.L.S., *Assistant Professor Emerita of University Libraries,* (2001-09).
GRAY, Clarence C., II, Ph.D., *Professor Emeritus of International Studies,* (1984-89).
GRAY, F. Gail, Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1971-03).
GRAY, George Alexander, D.Eng., P.E., *Associate Dean Emeritus of Engineering,* (1959-84).
GRAYBEAL, Evelyn A., M.S., *Assistant Professor Emerita of the University,* (1978-97).
GRAYBEAL, Jack D., Ph.D., *Professor Emeritus of Chemistry,* (1968-97).
GRAYSON, Randolph L., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science,* (1983-03).
GRENDER, Gordon C., Ph.D., P *rofessor Emeritus of Petrology,* (1966-90).[2, 3]
GRIFFIN, Gary J., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science*, (1967-03).
GRIGGS, Walter L., M.S., *Associate Professor Emeritus of Education,* (1948-80).
GROSS, Walter Burnham, D.V.M., Ph.D., *Professor Emeritus of Large Animal Clinical Sciences*, (1949-91).
GROSSMAN, Bernard, Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering,* (1982-2008).
GROVER, Norman LaMotte, Ph.D., *Professor Emeritus of Religion,* (1957-90).
GURDAL, Zafer, Ph.D., *Professor Emeritus of Engineering Science and Mechanics and Aerospace and Ocean Engineering,* (1985-06).
GUREL, Lois M., Ph.D., *Associate Professor Emerita of Clothing and Textiles,* (1971-93).
HACKLER, Margaret, *Senior Extension Agent Emerita,* (1972-02).
HAHN, Thomas Marshall, Jr., Ph.D., *President Emeritus,* (1954-74).
HALE, Edward Benton, M.S., *Associate Professor Emeritus of Agricultural Economics,* (1960-83).
HALL, John R., III, Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1976-01).
HALL, Otis F., Ph.D., *Garland Gray Professor Emeritus of Forestry,* (1974-91).
HALLOCK, Daniel Leroy, Ph.D., *Professor Emeritus of Agronomy,* (1952-83).
HAMMOND, Guy B., Ph.D., *Professor Emeritus of Religious Studies,* (1957-95).
HANEY, Anita I., M.L.S., *Assistant Professor Emerita of the University Libraries,* (1969-06).
HANEY, Harry L., Jr., Ph.D., *Garland Gray Professor Emeritus of Forestry*, (1975-03). [5]
HANNSGEN, Kenneth B., Ph.D., *Professor Emeritus of Mathematics*, (1972-02).
HARDER, Martha B., Ed.D., *Dean of Women and Associate Director Emerita of Financial Aid*, (1966-96).
HARMAN, Maryann W., *Professor Emerita of Art*, (1968-98).
HARRELL, Luther Mahlon, Jr., M.S., *Professor Emeritus of Accounting,* (1939-72).
HARRIS, Larry A., Ph.D., *Professor Emeritus of Education*, (1974-01).
HARRIS, Mary E., M.E., *Associate Professor Emerita of Family Resources,* (1967-80).
HARRIS, Ruth D., Ed.D., *Associate Professor Emerita of Virginia Cooperative Extension,* (1973-97).
HARRISON, Robert L., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences,* (1964-89).
HARSHBERGER, Richard F., Ed.D., *Associate Professor Emeritus* , (1969-03).
HARTSON, H. Rex, Ph.D., *Professor Emeritus of Computer Science,* (1976-02).
HASSELMAN, D.P.H., Ph.D., *Professor Emeritus of Engineering Science and Mechanics,* (1977-99).
HAUGH, C. Gene, Ph.D., *Professor Emeritus of Biological Systems Engineering*, (1979-02).
HAWKINS, George W., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences,* (1962-89).[5]
HEATH, Alan G., Ph.D., *Professor Emeritus of Biology*, (1964-00).
HEATH-CAMP, Betty, Ph.D., *Professor Emerita of Teaching and Learning*, (1979-03).
HECHTMAN, Robert Aaron, Ph.D., *Professor Emeritus of Environmental and Urban Systems,* (1974-81).
HEDGEPETH, Roger E., *Associate Professor Emeritus of Mechanical Engineering*, (1955-93).
HELFRICH, Louis A., Ph.D., *Professor Emeritus of Fisheries and Wildlife Sciences,* (1976-06).
HELLER, Robert A., Ph.D., P.E., *Professor Emeritus of Engineering Science and Mechanics,* (1967-96)
HENNEKE, Edmund G., Ph.D., *Professor and Associate Dean Emeritus of the College of Engineering,* (1971-2007).
HENDRICKS, Albert C., Ph.D., *Associate Professor Emeritus of Biology*, (1971-02).
HENRY, Michael L., *Senior Extension Agent Emeritus*, (1973-02).
HENRY, Sallie M., Ph.D., *Associate Professor Emerita of Computer Science,* (1984-03).
HENSLEY, Wayne E., Ph.D., *Associate Professor Emeritus of Communication Studies*, (1979-01).
HERBEIN, Joseph H., Jr., Ph.D., *Associate Professor Emeritus of Dairy Science,* (1978-06).[2]
HERBERT, Leo, Ph.D., CPA, *Professor Emeritus of Accounting,* (1975-83).
HERBERT, William G., Ph.D., *Professor Emeritus of Human Nutrition, Foods and Exercise,* (1971-2008).
HERNDON, Fred P., Ph.D., *Senior Extension Agent Emeritus*, (1976-02).
HERNDON, James F., Ph.D., *Professor Emeritus of Political Sciences,* (1974-94).
HERTEL, Bradley Ross, Ph.D., *Associate Professor Emeritus of Sociology,* (1976-2008).
HERTZLER, Ann A., Ph.D., *Professor Emerita of Human, Foods and Exercise*, (1980-01).
HESS, John L., Ph.D., *Professor Emeritus of Biochemistry,* (1967-06).
HETZEL, Glen H., Ph.D., *Associate Professor Emeritus of Biological Systems Engineering*, (1967-99).
HEWITT, David A., Ph.D., *Professor Emeritus of Geology*, (1975-98).
HEWLETT, Thelma T., M.A., *Associate Professor Emerita (Extension),* (1930-74).
HIBBARD, Walter R., Jr., D.Eng., *University Distinguished Professor Emeritus of Engineering,* (1974-88).
HILLISON, John H., Ph.D., *Professor Emeritus of Agricultural and Extension Education*, (1976-06).
HINKELMANN, Klaus, Ph.D., *Professor Emeritus of Statistics*, (1966-99).
HIPSHMAN, Mary, B., M.C.Pl., *Associate Professor Emerita of Environmental and Urban Systems,* (1974-77).
HOEHN, Robert C., Ph.D., *Professor Emeritus of Civil Engineering,* (1970-97).
HOEPNER, Paul H., Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1959-99).
HOERNER, James, Ph.D., *Professor Emeritus of Vocational and Technical Education,* (1974-05).

HOFFENBERGER, Joseph B., *Senior Extension Agent Emeritus*, (1972-02).
HOGE, James O. Jr., Ph.D., *Professor Emeritus of English,* (1975-05).
HOHENBOKEN, William D., Ph.D., *Professor Emeritus of Animal and Poultry Sciences*, (1987-01).
HOHENSHIL, Thomas H., Ph.D., *Professor Emeritus of Counselor Education,* (1972-04).[1]
HOLLIMAN, Rhodes B., Ph.D., *Professor Emeritus of Zoology,* (1962-91).[3, 4]
HOLT, Charles Asbury, Ph.D., *Professor Emeritus of Electrical Engineering,* (1954-85).
HOLZER, Siegfried M., Ph.D., *Alumni Distinguished Professor Emeritus of Civil and Environmental Engineering*, (1972-01).[2, 3, 4]
HOPKINS, M.H., Ph.D., *Associate Professor Emeritus of Electrical Engineering,* (1955-92).
HORNE, Burt Cleveland, Jr., M.A., *Associate Professor Emeritus of Mathematics*, (1938-81).
HORSBURGH, Robert L., Ph.D., *Professor Emeritus of Entomology,* (1974-96).
HOSKISSON, Kenneth, Ph.D., *Professor Emeritus of Education,* (1971-93).
HOSNER, John F., Ph.D., *Professor Emeritus of Forestry and Wildlife*, (1961-92).
HOUCK, Cherry K., Ph.D., *Professor Emerita of Teaching and Learning,* (1970-02).
HOUSKA Charles R., Sc.D., *Professor Emeritus of Materials Science and Engineering*, (1963-92).
HOUSTON, Michael E., Ph.D., *Professor Emeritus of Human Nutrition, Foods and Exercise,* (1998-2008).
HOWARD, Thomas C., Ph.D., *Associate Professor Emeritus of History,* (1966-2008).
HOWE, Barbara, *Senior Extension Agent Emerita*, (1973-02).
HOYSA, Charles R., *Senior Extension Agent Emeritus*, (1980-02).
HUANG, Philip Y., Ph.D., *Suzanne Parker Thornhill Professor Emeritus of Management Science and Information Technology,* (1979-2007).
HUBBARD, Hazel C., M.A.L.S., *Associate Professor Emerita, Library,* (1962-81).
HUDDLESTON, John S., Ed.D., *Associate Professor Emeritus, Cooperative Extension,* (1963-91).
HUFF, Arden Nelson, Ph.D., *Professor Emeritus of Animal Science*, (1973-89).
HUGHES, J. Martin, Ph.D., *Associate Professor Emeritus of Civil and Environmental Engineering*, (1974-02).
HUMES, Charles W., Ed.D., *Professor Emeritus of Education,* (1980-93).
HUMMEL, Dean L., Ph.D., *Professor Emeritus of Education,* (1971-83).
HUMPHREYVILLE, Theresa R., Ed.D., *Assistant Dean Emerita of Human Resources,* (1976-83).
HUNT, Thomas C., Ph.D., *Professor Emeritus of Education*, (1971-96).
HUNTER, John H., Ph.D., *Associate Professor Emeritus of Civil Engineering*, (1960-89).
HURST, Charles J., Ph.D., *Professor Emeritus of Mechanical Engineering*, (1965-92).
HURST, Homer Theodore, P.E., *Professor Emeritus of Agricultural Engineering,* (1955-90).
HUTCHINS, David E., Ph.D., *Professor Emeritus of Educational Leadership and Policy Studies*, (1971-02).
HUTSON, Barbara A., Ed.D., *Professor Emerita of Teaching and Learning*, (1979-2000).
IFJU, Geza, Ph.D., *Professor Emeritus of Wood Science and Forest Products*, (1964-00).
INDEBETOUW, Guy J. M., Ph.D., *Professor Emeritus of Physics,* (1978-2008).
INTERMAGGIO, Joseph L., M.R.P., *Professor Emeritus of Environmental and Urban Systems,* (1967-80).
IRVIN, Emory R., M.D., *Director Emeritus of Student Health Services,* (1956-73).
ISANI, Mukhtar Ali, Ph.D., *Professor Emeritus of English*, (1966-02).
JACKSON, Randal W., *Senior Extension Agent Emeritus*, (1973-02).
JACOEBEE, Willy P., Ph.D., *Associate Professor Emeritus of French*, (1970-98).
JAKUBOWSKI, Antoni K., Ph.D., *Associate Professor Emeritus of Aerospace Engineering,* (1965-92).
JAMISON, Ruth Adelaide, M.A., *Associate Professor Emerita of Home Economics Extension,* (1926-61).
JANEY, Jane P., Ed.D., *Associate Professor Emerita, Extension,* (1974-91).
JENKINS, David A., Ph.D., *Professor Emeritus of Physics*, (1965-97).
JENSEN, Donald R., Ph.D., *Professor Emeritus of Statistics,* (1965-2005).
JENSSEN, Thomas A., Ph.D., *Associate Professor Emeritus of Biological Sciences,* (1971-07).
JOHNSON, Eric R., Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering*, (1976-03).
JOHNSON, Harry L., Ph.D., *Associate Professor Emeritus of Mathematics*, (1965-92).
JOHNSON, James F., Ed.D., *Associate Professor Emeritus, Cooperative Extension,* (1961-92).
JOHNSON, Janet M., Ph.D., *Professor of Human Nutrition, Foods, and Exercise and Dean Emerita of the College of Human Resources and Education*, (1972-02).
JOHNSON, John L., Ph.D., *Professor Emeritus of Anaerobic Microbiology,* (1968-96).
JOHNSON, Lee W., Ph.D., *Professor Emeritus of Mathematics*, (1967-00).
JONES, C. Clark, Ph.D., *Vice Provost for Outreach and International Affairs*, (1971-03).
JONES, Gerald M., Ph.D., *Professor Emeritus of Dairy Science*, (1974-02).
JONES, James B., Ph.D., P.E., *Lingan S. Randolph Professor Emeritus of Mechanical Engineering,* (1964-88).
JONES, James L., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1971-02). 5
JONES, Judith H., Ph.D., *Associate Professor Emerita of Extension Administration*, (1979-04).
JONES, Louetta M., *Senior Extension Agent Emerita*, (1976-02).
JONES, Robert Millard, Ph.D., *Professor Emeritus of Engineering Science and Mechanics*, (1981-00).
JONES, Roy S., Ed.D., *Associate Professor Emeritus of Continuing and Professional Education,* (1988-07).
KALKA, Beatrice S., Ed.D., *Associate Professor Emerita of Clothing and Textiles,* (1971-88).
KAPLAN, David M., Ph.D., *Associate Professor Emeritus of Physics,* (1962-83).
KARK, Warren R., M.Arch., *Professor Emeritus of Architecture*, (1966-02).
KASS, Raymond R., M.F.A., *Professor Emeritus of Art*, (1976-03).
KEENAN, Thomas W., Ph.D., *Professor Emeritus of Biochemistry,* (1982-05).
KEITH, Janet E., D.B.A., *Professor Emerita of Marketing,* (1984-2005).
KELLER, James F., Ph.D., *Professor Emeritus of Family and Child Development,* (1973-97).
KELLY, Patricia Proudfoot, Ed.D., *Professor Emerita of Teaching and Learning*, (1977-03).
KELLY, Robert F., Ph.D., *Professor Emeritus of Food Science and Technology,* (1955-89).
KEMMERLING, Paul T., Ph.D., *Associate Professor Emeritus of Industrial and Systems Engineering,* (1979-95).
KENNEDY, Charles A., Ph.D., *Professor Emeritus of Religion,* (1967-94).

KENYON, David E., Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1971-02). [2,3]
KERNS, Waldon R., Ph.D., *Professor Emeritus of Agricultural and Applied Economics,* (1975-03).
KIBLER, David F., Ph.D., *Professor Emeritus of Civil and Environmental Engineering,* (1990-2008).
KING, Howard P., M.S., *Director Emeritus of Dining Halls,* (1955-89).
KIRKPATRICK, Roy L., Ph.D., *Professor Emeritus of Fisheries and Wildlife Sciences*, (1966-01).
KLEMPERER, W. David, Ph.D., *Professor Emeritus of Forestry*, (1976-01).
KOHL, David M., Ph.D., *Professor Emeritus of Agricultural and Applied Economics,* (1978-03). [2,3,8]
KORSLUND, Mary K., Ph.D., *Associate Professor Emerita of Human Nutrition and Foods,* (1964-95).
KOSZTARAB, Michael, Ph.D., *Professor Emeritus of Entomology,* (1962-91). [2, 3]
KREBS, Robert D., M.Engr., *Associate Professor Emeritus of Civil Engineering,* (1955-91).
KREBS, Alfred H., Ph.D., *Vice President Emeritus of Administration,* (1969-81).
KRIEG, Noel R., Ph.D., *Alumni Distinguished Professor Emeritus of Biology*, (1960-98).
KROEMER, Karl H. E., D.Eng, *Professor Emeritus of Industrial and Systems Engineering*, (1981-98).
KRONENBERG, Philip S., Ph.D., *Professor Emeritus of Public Administration and Policy,* (1977-06).
KRUTCHKOFF, Richard G., Ph.D., *Professor Emeritus of Statistics,* (1964-96).
KUBIN, Konrad W., Ph.D., *Professor Emeritus of Accounting and Information Systems*, (1972-03).
KUPPUSAMY, Thangavelu, Ph.D., *Professor Emeritus of Civil and Environmental Engineering*, (1976-01).
KURSTEDT, Harold A., Ph.D., *Hal G. Prillaman Professor Emeritus of Industrial and Systems Engineering*, (1974-03).
LACY, Donald P., Ph.D., *Associate Professor Emeritus of Agriculture and Applied Economics,* (1968-99).
LACY, George H., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science*, (1980-03).
LALIK, Rosary V., Ed.D., *Associate Professor Emerita of the School of Education,* (1982-2008).
LAMB, Fred M., Ed.D., *Professor Emeritus of Wood Science and Forest Products*, (1968-01).
LAMBE, Robert C., Ph.D., *Associate Professor Emeritus of Plant Pathology,* (1967-89).
LANDEN, Robert G., Ph.D., *Professor Emeritus of History and Humanities,* (1988-95).
LaPORTE, James E., Ph.D., *Professor Emeritus of Teaching and Learning*, (1982-03).
LAPRADE, John Lovelace, M.S., *Associate Professor Emeritus of Plant Pathology,* (1936-70).
LARSEN, Calvert T., D.V.M., *Associate Professor Emeritus of Large Animal Clinical Sciences*, (1979-02).
LAYMAN, John W., Ph.D., *Associate Professor Emeritus of Mathematics,* (1958-95).
LEDERMAN, Muriel, Ph.D., *Associate Professor Emerita of Biology,* (1977-04).
LeDOUX, John Carver, M.S., B.C.E., *Associate Professor Emeritus of Engineering Fundamentals,* (1981-92).
LEE, Audrey Oliver, *Senior Extension Agent Emerita*, (1973-02).
LEE, John A. N., Ph.D., *Professor Emeritus of Computer Science,* (1974-03).
LEIGH, Janet L., *Senior Extension Agent Emerita,* (1972-02).
LEIGHTON, Alvah T., Jr., Ph.D., *Professor Emeritus of Animal and Poultry Science,* (1959-96).
LEININGER, Wayne E., Ph.D., *Professor Emeritus of Accounting and Information Systems*, (1971-03).
LENTNER, Marvin, Ph.D., *Professor Emeritus of Statistics*, (1975-00).
LEONARD, Robert G., Ph.D., *Professor Emeritus of Mechanical Engineering*, (1960-98).
LESTER, C. Ned, Ph.D., *Professor Emeritus of Business and Community Relations,* (1957-96).
LEVY, John M., Ph.D., *Professor Emeritus of Urban Affairs and Planning*, (1979-03).
LILLARD, James Heber, M.S., *Professor Emeritus of Agricultural Engineering,* (1936-74).
LINDSTROM, Richard S., Ph.D., *Professor Emeritus of Horticulture,* (1968-87).
LOEKS, C. David, *Professor Emeritus of Urban and Regional Planning*, (1980-88).
LONG, Clarence Hardy, M.S., *Professor Emeritus of Mechanical and Nuclear Engineering,* (1942-83).
LONG, Don L., Ph.D., *Professor Emeritus of Agricultural Economics,* (1959-84).
LONG, Jerome R., Ph.D., *Associate Professor Emeritus of Physics*, (1967-02).
LOPEZ, Anthony, Ph.D., *Professor Emeritus of Food Science and Technology,* (1954-88).
LOVINGOOD, Rebecca P., *Professor Emerita of Near Environments,* (1973-99).
LOWRY, Wallace Dean, Ph.D., *Professor Emeritus of Geology,* (1949-82).
LUCKHAM, William R., Ph.D., *Associate Professor Emeritus of Agricultural Economics,* (1959-90).
LUDWIG, Daniel D., Ph.D., *Associate Professor Emeritus of Engineering,* (1980-97).
LUX, George R., M.S., *Associate Professor Emeritus of Engineering Fundamentals,* (1977-94).
LYTTON, Jack L., Ph.D., *Professor Emeritus of Materials Science and Engineering,* (1965-92).
MADIGAN, Robert M., Ph.D., *Associate Professor Emeritus of Management*, (1978-99).
MAHAN, Beatrice T., M.B.A., *Associate Vice President Emerita for Budget & Financial Planning*, (1973-03).
MAHER, Francis Joseph, M.S., *Professor Emeritus of Engineering Science and Mechanics,* (1937-78).[2]
MALONE, James H., Ph.D., *Director Emeritus of Career Services*, (1970-02).
MANDELSTAMM, Allan B., Ph.D., *Professor Emeritus of Economics,* (1975-90).[2, 4]
MANN, Jerry E., Ph.D., *Associate Professor Emeritus of Statistics,* (1976-98).
MARCHMAN, James F., Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering,* (1968-06).
MARRIOTT, Norman G., Ph.D., *Professor Emeritus of Food Science and Technology*, (1976-02). [5]
MARSHALL, McNeil, B.S., *Associate Professor Emeritus of Agricultural Engineering,* (1947-73).
MARTENS, David C., Ph.D., *Professor Emeritus of Crop and Soil Environmental Science*, (1964-98).
MARTIN, Edwin P., Ph.D., *Professor Emeritus, Learning Resources,* (1974-88).
MARTIN, Esther Alice, Ph.D., *Associate Professor Emerita of Housing, Interior Design, and Resource Management,* (1964-83).
MARTIN, Joyce A., Ph.D., *Senior Extension Agent Emerita*, (1972-02).
MARTIN, Kennith H., M.S., *Associate Professor Emeritus for Virginia Cooperative Extension,* (1969-95).
MARVIN, Frank F., *Associate Professor Emeritus of Engineering Fundamentals,* (1970-88).
MASHBURN, William H., B.S., *Professor Emeritus of Extension and Mechanical Engineering,* (1968-96).
MASON, John G., Ph.D., *Professor Emeritus of Chemistry,* (1959-92). [8]
MASON, J. Phillip Jr., Ph.D., *Professor Emeritus of Agricultural Engineering*, (1955-91). [3]

MASSEY, Peyton Howard, Jr., Ph.D., *Associate Dean Emeritus of Agriculture and Life Sciences,* (1952-89).
MAXWELL, Joseph W., Ph.D., *Professor Emeritus of Family and Child Development*, (1967-98).
McALISTER, J. Douglas, Ed.D., *Professor Emeritus of University Outreach and International Affairs*, (1974-03).
McANGE, Thomas R., Jr., M.E., *Assistant Professor Emeritus of Extension,* (1976-07).
McBRIDE, Cecil M., M.S., *Associate Professor Emeritus, Extension,* (1957-88).
McCART, Gerald, D., Ph.D., *Associate Professor Emeritus of Agronomy,* (1968-84).
McCARTNEY, Robert W., M.A., *Associate Professor Emeritus, Library,* (1971-81).
McCOY, Lenwood D., *University Controller and Associate Vice President Emeritus for Strategic Initiatives,* (1961-04).
McCOY, Robert A., Ph.D., *Professor Emeritus of Mathematics*, (1968-00).
McDANIELS, Carl O., Ph.D., *Professor Emeritus of Education*, (1969-98).
McDOWELL, George R., Ph.D., *Professor Emeritus of Agricultural and Applied Economics,* (1987-05).
McELWEE, Robert L., Ph.D., *Professor Emeritus of Forestry,* (1971-89).
McLAIN-KARK, Joan, Ph.D., *Professor Emerita of Interior Design*, (1980-03).
McLAUGHLIN, Gerald W., Ph.D., *Director Emeritus of Institutional Research and Planning Analysis,* (1971-99).
McLEAN, Dewey, Ph.D., *Professor Emeritus of Geology,* (1969-95).
McMILLION, Martin Bert, Ed.D., *Associate Professor Emeritus of Agricultural Education,* (1972-96).
McNABB, Roger A., Ph.D., *Professor Emeritus of Biology,* (1969-94).
McNAIR, Harold M., Ph.D., *Professor Emeritus of Chemistry*, (1968-02). [2,7]
McPETERS, Larry L., *Senior Extension Agent Emeritus*, (1971-02).
McPHERSON, Malcolm J., Ph.D., *Massey Professor Emeritus of Mining and Minerals Engineering*, (1992-02).
MEACHAM, Thomas N., Ph.D., *Associate Professor Emeritus of Animal Science,* (1962-92).
MEADOWS, Robert Ray, Ph.D., *State 4-H Director Emeritus,* (1985-2007).
MEIROVITCH, Leonard, Ph.D., *University Distinguished Professor Emeritus of Engineering Science and Mechanics*, (1971-98).
MEISELMAN, David I., Ph.D., *Professor Emeritus of Economics,* (1971-97).
MELLEN, Philip A., Ph.D., *Professor Emeritus of German,* (1980-05). [2, 3]
MICHAELS, James W., Ph.D., *Professor Emeritus of Sociology*, (1975-03).
MICHELSEN, Donald L., Ph.D., *Associate Professor Emeritus of Chemical Engineering,* (1966-92).
MIFFLIN, Betty Sue, M.S., *Associate Professor Emerita of Home Economics*, (1969-89).
MICK, Harold W., Ph.D., *Professor Emeritus of Mathematics and Education*, (1974-02).
MILBOCKER, Daniel C., Ph.D., *Associate Professor Emeritus of Horticulture,* (1985-95).
MILLER, Harlan B., Ph.D., *Professor Emeritus of Philosophy*, (1966-02).
MILLER, Kathy R., *Senior Extension Agent Emerita*, (1980-02).
MILLER, Lawrence I., Ph.D., *Professor Emeritus of Plant Pathology and Physiology,* (1940-80).
MILLER, Orson K., Ph.D., *Professor Emeritus of Biology*, (1970-02).
MILLER, Robert H., Ph.D., *Associate Professor Emeritus of Electrical Engineering,* (1964-91).
MINISH, Gary L., Ph.D., *Professor Emeritus of Animal and Poultry Sciences*, (1966-00).
MINISH, Roberta, Ed.D., *Associate Dean Emerita of the College of Human Resources and Education*, (1977-00).
MISRA, Hara P., Ph.D., *Professor Emeritus of Biomedical Sciences and Pathobiology,* (1985-04).
MISCHKE, Roland, Ph.D., *Associate Professor Emeritus of Chemical Engineering,* (1961-88).
MITCHELL, James K., Ph.D., *University Distinguished Professor Emeritus of Civil and Environmental Engineering,* (1994-99).
MITCHELL, Larry D., Ph.D., *Lingan S. Randolph Professor Emeritus of Mechanical Engineering*, (1971-01).
MO, Luke W., Ph.D., *Professor Emeritus of Physics*, (1976-02). [6]
MONTGOMERY, James R., Ph.D., *Professor and Director Emeritus of Institutional Research and Planning Analysis,* (1968-91).
MOOK, Dean T., Ph.D., *N. Waldo Harrison Professor Emeritus of Engineering Science and Mechanics,* (1966-03).
MOORE, David M., Ph.D., *Professor Emeritus of Teaching and Learning*, (1972-03).
MOORE, James McCaughan, M.S., *Associate Professor Emeritus of Agricultural Economics,* (1963-88).
MOORE, John, M.A., *Professor Emeritus of Mechanical Engineering*, (1979-97).
MOORE, Lillian V., Ph.D., *University Distinguished Professor Emerita of Anaerobic Microbiology,* (1966-95).
MOORE, Laurence D., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science*, (1965-03).
MOORE, Laurence J., Ph.D., *Verizon Professor Emeritus of Business Information Technology,* (1970-07).
MOORE, Paul J., Ph.D., *Professor Emeritus, Adult and Continuing Education,* (1966-74).
MOOSE, Richard L., Ph.D., *Associate Professor Emeritus of Electrical and Computer Engineering*, (1972-01).
MORRILL, Robert W., Ph.D., *Professor Emeritus of Geography*, (1973-02).
MORRIS, Don H., Ph.D., *Professor Emeritus of Engineering Science and Mechanics,* (1977-05). [4]
MORSE, Ronald D., Ph.D., *Associate Professor Emeritus of Horticulture*, (1975-03).
MOSCHLER, William Witcher, M.S., *Associate Professor Emeritus of Agronomy,* (1948-76).
MOZINGO, R. Walton, *Professor Emeritus of Agronomy*, (1968-02).
MUNSEY, Betty K., *Senior Extension Agent Emerita*, (1984-00).
MUNSON, Hugh, M.S., P.E., *Associate Professor Emeritus of Engineering Fundamentals*, (1977-98). [2, 3,4]
MURRAY, Thomas M., Ph.D., *Montague-Betts Professor Emeritus of Civil and Environmental Engineering,* (1987-2008).
MUSSER, Stanton R., Major General, *Commandant Emeritus of the Corps of Cadets,* (1989-99).
MYERS, Derek S., M.F.A., *Associate Professor Emeritus of Art and Art History*, (1973-03).
MYERS, James A., *Senior Extension Agent Emeritus*, (1972-02).
MYERS, Lester H., Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1992-02).
MYERS, Raymond, Ph.D., *Professor Emeritus of Statistics,* (1971-95).
MYKLEBUST, Arvid, Ph.D., *Professor Emeritus of Mechanical Engineering*, (1983-03).
NANCE, Richard E., Ph.D., *Professor Emeritus of Computer Science,* (1973-03).
NEBEL, Raymond L., Ph.D., *Professor Emeritus of Dairy Science,* (1985-05).
NEUMANN, Franke J., Ph.D., *Associate Professor Emeritus of Religious Studies*, (1970-98).
NEVES, Richard J., Ph.D., *Professor Emeritus of Fisheries and Wildlife Sciences,* (1978-2008).

NEY, John J., Ph.D., Professor Emeritus of Fisheries Science, (1976-2005).
NICHOLS, James R., Ph.D., *Professor and Dean Emeritus of Agriculture and Life Sciences,* (1964-92).
NICKERSON, M. Carole, M.S., *Executive Assistant Emerita to the President*, (1986-00).
NIEHAUS, Walter G., Jr., Ph.D., *Associate Professor Emeritus of Biochemistry*, (1975-98).
NILES, Jerome A., Ed.D., *Professor and Dean Emeritus of the College of Liberal Arts and Human Sciences,* (1974-07).[2,3]
NORSTEDT, Johann A., Ph.D., *Associate Professor Emeritus of English*, (1972-02). [1]
NOVASCONE, Mary Ann, Ph.D., *Associate Professor Emerita of Human Nutrition, Foods, and Exercise*, (1983-98).
NUNNALLY, Richard A., *Senior Extension Agent Emeritus*, (1970-02).
NURSE, Ronald J., Ph.D., *Associate Professor Emeritus of History*, (1971-02).[2, 4]
OCHSENWALD, William L., Ph.D., *Professor Emeritus of History,* (1971-2008).
O'DELL, Charles R., M.S., *Associate Professor Emeritus of Horticulture*, (1968-01).
O'DONNELL, J. Dean, Ph.D., *Associate Professor Emeritus of History,* (1970-07).
OGLIARUSO, Michael A., Ph.D., *Professor Emeritus of Chemistry,* (1967-96).
OLIVER, James Dale, Ph.D., *Professor Emeritus of Vocational and Technical Education,* (1960-92).
OLSEN, Michael D., Ph.D., *Professor Emeritus of Hospitality and Tourism Management,* (1976-2007).
ORCUTT, David M., Ph.D., *Professor Emeritus of Plant Pathology, Physiology and Weed Science*, (1973-02).
OSBORNE, John E., M.S., *Associate Dean Emeritus of the College of Engineering*, (1968-98).
OVERTON, Edward T., *Senior Extension Agent Emeritus*, (1971-02).
OWEN, James J., M.S., *Associate Professor Emeritus of English,* (1957-93). [2, 3, 4, 9]
PACE, Wesley Emory, M.A., *Associate Professor Emeritus of Mathematics,* (1953-87).
PAINTER, R. Keith, M.S., *Associate Professor Emeritus, Extension,* (1960-90).
PALERMO, Joseph, Ph.D., *Professor Emeritus of French,* (1974-86).
PALMER, James K., Ph.D., *Professor Emeritus of Food Science and Technology,* (1975-91).
PARKER, Bruce C., Ph.D., *Professor Emeritus of Biology*, (1969-02).
PARKINSON, Thomas F., Ph.D., *Professor Emeritus of Mechanical and Nuclear Engineering,* (1975-90).
PARSON, Stephen R., Ed.D., *Associate Professor Emeritus of Educational Leadership and Policy Studies,* (1974-05).
PARSONS, Robert A., M.F.A., *Associate Professor Emeritus of Interior Design, (1981-05).*
PATTERSON, William Norman, M.S., *Associate Professor Emeritus of Dairy Science,* (1953-82).
PATTY, Clarence Wayne, Ph.D., *Professor Emeritus of Mathematics,* (1967-2007).
PENDERGRASS, Barbara J., Ed.D., *Dean Emerita of Students*, (1976-03).
PENDLETON, John Davis, Ph.D., *Associate Professor Emeritus of Agronomy,* (1946-77).
PERKINS, Charles R., Ed.D., *Associate Professor Emeritus of Agricultural Economics,* (1963-91).
PERRY, John M., Ph.D., *Provost Emeritus,* (1977-89).
PERUMPRAL, John V., Ph.D., *William S. Cross Professor Emeritus of Biological Systems Engineering*, (1970-03).
PETTWAY, Herbert W., *Senior Extension Agent Emeritus*, (1973-02).
PFAFFLIN, Nancy, *Senior Extension Agent Emerita*, (1980-00).
PFEIFFER, Carl J., Ph.D., *Professor Emeritus of Biomedical Sciences*, (1982-00).
PHADKE, Arun G., Ph.D., *University Distinguished Professor Emeritus of Electrical and Computer Engineering*, (1982-03).
PHILLIPS, Edsel L., M.S., *Associate Professor Emeritus of Horticulture*, (1955-86).
PHILSON, Mabel Kathryn, Ph.D., *Professor Emerita of Management, Housing and Family Development,* (1963-73).[2]
PIENKOWSKI, Robert L., Ph.D., *Professor Emeritus of Entomology,* (1961-96).
PIERCE, Felix J., Ph.D., *Professor Emeritus of Mechanical Engineering*, (1966-98).
PIERSON, Merle D., Ph.D., *Professor Emeritus of Food Science and Technology,* (1970-05). [2]
PINNOCK, Theodore J., Ph.D., *Professor Emeritus, Extension Division,* (1980-90).
PIRIE, Walter R., Ph.D., *Associate Professor Emeritus of Statistics*, (1970-97).
PLAMBECK, Donald L., Ph.D., *Associate Professor Emeritus of Public Service,* (1986-94).
PLAUT, Raymond H., Ph.D., *D. H. Pletta Professor Emeritus of Civil and Environmental Engineering,* (1975-2008).
POLAN, Carl E., Ph.D., *Professor Emeritus of Dairy Science*, (1965-97).
POOLE, A. Travis Jr., Ph.D., *Associate Professor Emeritus, Cooperative Extension,* (1960-91).
PORTER, Duncan M., Ph.D., *Professor Emeritus of Biological Sciences,* (1984-2008).
PORTER, Hobart Clarke, B.S., *Associate Professor Emeritus of Agronomy,* (1936-73).
POST, Daniel, Ph.D., *Professor Emeritus of Engineering Science and Mechanics,* (1978-91).
POTTER, Lawrence M., Ph.D., *Professor Emeritus of Poultry Science,* (1960-89).
PRESTRUDE, Albert M., Ph.D., *Associate Professor Emeritus of Psychology*, (1969-99).
PRICE, Dennis L., Ph.D., *Professor Emeritus of Industrial and Systems Engineering,* (1974-96).
PROCTOR, Felice Noelle, M.F.A., *Professor Emeritus of Theatre Arts*, (1978-02).
PROUTY, Robert Bruce, M.S., C.P.A., *Associate Professor Emeritus of Accounting,* (1953-84).
PURCELL, Wayne D., Ph.D., Alumni Distinguished Professor Emeritus of Agricultural and Applied Economics, (1978-05). 2,4,9
PUSEY, Robert Hollis, Ph.D., *Associate Professor Emeritus of Engineering Fundamentals*, (1961-01)
PYLE, Robert Lee, V.M.D., M.S., Diplomate, ACVIM, *Professor Emeritus of Small Animal Clinical Sciences,* (1981-2007).
RANDALL, Clifford W., Ph.D., *Professor Emeritus of Civil and Environmental Engineering*, (1968-01).
RAPOPORT, Leo Alexander, D.Eng., *Professor Emeritus of Geological Sciences,* (1974-84).
REECE, Barry L., Ed.D., *Professor Emeritus of Marketing Education*, (1974-93).
REED, Bruce E., Ph.D., *Associate Professor Emeritus of Mathematics*, (1967-03). [2,3]
REIFSNIDER, Kenneth L., Ph.D., *Professor Emeritus of Engineering Science and Mechanics*, (1968-02).
RELF, Paula Diane Relf, Ph.D., *Professor Emerita of Horticulture*, (1976-02).
RENEAU, Raymond B., Jr., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1971-02).
REYNOLDS, Robert Kenneth, M.S., *Associate Professor Emeritus of Agricultural Economics,* (1958-87).
RIBBE, Paul H., Ph.D., *Professor Emeritus of Geological Sciences,* (1966-96).
RICH, Nolan Neel, M.S., *Associate Professor Emeritus, Extension Division,* (1959-90).

RICHARDSON, Bonham C., Ph.D., *Professor Emeritus of Geography*, (1977-02).
RICHARDSON, Frederick M., Ph.D., *Professor Emeritus of Accounting and Information Systems,* (1980-2007).
RIDENOUR, Minnis E., *Executive Vice President and Chief Operating Officer Emeritus,* (1974-05).
RIESS, R. Dean, Ph.D., *Professor Emeritus of Mathematics,* (1967-06).[1]
RITCHEY, Sanford J., Ph.D., *Professor and Dean Emeritus of the College of Human Resources,* (1963-94)
RITENOUR, Lester A., *Senior Extension Agent Emeritus*, (1974-02).
ROANE, Curtis Woodard, Ph.D., *Professor Emeritus of Plant Pathology,* (1947-86).
ROBBINS, William A., Ed.D., *Associate Professor Emeritus of Education,* (1979-85).
ROBERTS, James E., Sr., Ph.D., *Associate Professor Emeritus of Entomology,* (1969-88).
ROBERTS, Kent C., Ph.D., *Associate Professor Emeritus of Veterinary Medicine* (1980-95).
ROBERTSHAW, Harry H., Ph.D., *Professor Emeritus of Mechanical Engineering,* (1970-06).
ROBESON, Andrew, Ph.D., *Professor Emeritus of Nuclear Engineering,* (1955-81).
ROBINSON, Edwin S., Ph.D., *Professor Emeritus of Geophysics,* (1967-97).
ROBINSON, Jerald F., Ph.D., *Professor Emeritus of Management*, (1970-02). [2]
ROBINSON, Linda M., *Senior Extension Agent Emerita,* (1971-02).
ROGERS, Cosby Steele, Ph.D., *Professor Emerita of Human Development*, (1973-03). [2,4]
ROGERS, William Bradley, M.A., *Professor Emeritus of Engineering Fundamentals,* (1971-87).
ROGGENBUCK, Joseph W., Ph.D., *Professor Emeritus of Forestry,* (1977-06).
ROHR, John A., Ph.D., *Professor Emeritus of Public Administration and Policy,* (1979-2008).
ROLLINS, Howard A., Jr., Ph.D., *Professor Emeritus of Horticulture,* (1969-90).
RONY, Peter R., Ph.D., *Professor Emeritus of Chemical Engineering*, (1971-02).
ROPER, Jeanne H., Ph.D., *Professor Emerita of Urban Affairs and Planning*, (1975-98).
ROPER, L. David, Ph.D., *Professor Emeritus of Physics*, (1967-98).
ROSEN, Karen H., Ed.D., *Associate Professor Emerita of Human Development,* (1987-06).
ROSS, B. Blakely, Ph.D., *Professor Emeritus of Biological Systems Engineering*, (1978-02).
ROSS, Mary H., Ph.D., *Professor Emerita of Entomology,* (1959-97).
RUIZ, Fernando, M.Arch., *Associate Professor Emeritus of Architecture*, (1972-02). [2, 3]
RUSK, Richard Wells, M.S., *Associate Professor Emeritus of Physics,* (1949-82).
RUSSELL, G.E., Ph.D., *Vice President Emeritus of Alumni Relations,* (1956-96).
RYSTROM, Kenneth F., Ph.D., *Professor Emeritus of Communication Studies,* (1984-97).
SAACKE, Richard G., Ph.D., *Professor Emeritus of Dairy Science*, (1965-01). [2,3]
SABAROFF, Bernard J., C.E., R.A., *Professor Emeritus of Architecture,* (1967-82).
SABINE, Gordon Arthur, Ph.D., *Professor Emeritus of Journalism,* (1975-83).
SANDERSON, Ann G., M.S., *Assistant Professor Emerita, Cooperative Extension,* (1957-91).
SANDY, Raleigh A., M.A., *Associate Professor Emeritus of Dairy Science,* (1946-73).
SANZONE, George, Ph.D., *Associate Professor Emeritus of Chemistry*, (1969-98).
SAUNDERS, Walter L., Jr., M.S., *Associate Professor Emeritus, Extension Division,* (1958-86).
SAWYERS, Janet K., Ph.D., *Professor Emerita of Human Development*, (1979-03). [2,7,8]
SCARPACI, Joseph L., Ph.D., *Professor Emeritus,* (1989-2009).
SCHECKLER, Stephen E., Ph.D., *Professor Emeritus of Biological Sciences,* (1977-07).
SCHIFFERT, Charles Wilson, M.D., *Director Emeritus of Student Health Services,* (1968-86).
SCHMIDT, B. June, Ed.D., *Professor Emerita of Human Resources and Education*, (1979-98).
SCHMIDT, J. William, Jr., Ph.D., *Professor Emeritus of Industrial and Systems Engineering*, (1968-00).
SCHMIDT, Richard E., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1958-00).
SCHNECK, Daniel J., Ph.D., *Professor Emeritus of Engineering Science and Mechanics*, (1973-01). [2,3]
SCHNITZER, Martin, Ph.D., *Professor Emeritus of Management,* (1960-90).
SCHUG, John C., Ph.D., *Professor Emeritus of Chemistry*, (1964-99).
SCHULMAN, Robert S., Ph.D., *Associate Professor Emeritus of Statistics,* (1974-07).[2]
SCHWERTZ, Courtney, Ph.D., *Professor Emeritus of Virginia Cooperative Extension,* (1974-97).
SEWELL, Edward H., Jr., Ph.D., *Associate Professor Emeritus of Communication,* (1972-07).
SGRO, Joseph A., Ph.D., *Professor Emeritus of Psychology,* (1967-99).
SHABMAN, Leonard A., *Professor Emeritus of Agricultural and Applied Economics,* (1972-02).
SHACKELFORD, George Green, Ph.D., *Professor Emeritus of History,* (1954-86).
SHAFFER, Robert M., Ph.D., *Charles Nettleton Professor Emeritus of Forest Operations,* (1982-2007).
SHANHOLTZ, Vernon O., Ph.D., *Associate Professor Emeritus of Biological Systems Engineering,* (1963-97).
SHAW, John K., Ph.D., Professor Emeritus of Mathematics, (1970-2005).
SHEPARD, Jon M., Ph.D., *Professor Emeritus of Management*, (1989-03).
SHOULDERS, John F., M.S., *Professor Emeritus of Agronomy,* (1952-80).
SIEGEL, Paul, Ph.D., *University Distinguished Professor Emeritus of Animal and Poultry Sciences*, (1957-99).
SINHA, A. Krishna, Ph.D., *Professor Emeritus of Geosciences,* (1971-2008).
SKELTON, Margaret Groseclose, M.S., *Associate Professor Emerita of Family Resources, Extension,* (1960-76).
SLAYTON, Aubrey R., Ph.D., *Professor Emeritus of the Extension Division,* (1952-83).
SMEAL, Paul L., Ph.D., *Professor Emeritus of Horticulture,* (1960-92)
SMITH, Charles W., M.S., P.E., *Alumni Distinguished Professor Emeritus of Engineering Science and Mechanics,* (1948-92). [6]
SMITH, David William, Ph.D., *The Honorable and Mrs. Shelton H. Short, Jr., Professor Emeritus of Forestry*, (1972-00).
SMITH, Easley S., M.S., *Associate Professor Emeritus of Agricultural Engineering,* (1956-85).
SMITH, Frank E., B.A., *Professor Emeritus of Public Administration and Policy,* (1977-80).
SMITH, James C., Ph.D., *Associate Professor Emeritus of Mathematics,* (1967-97).
SMITH, Robert M., Ed.D., *Professor and Dean Emeritus of the College of Education,* (1978-96).
SNOKE, J. Arthur, Ph.D., *Professor Emeritus of Geosciences,* (1977-2007).

SNYDER, Harry L., Ph.D., *R.H. Bogle Professor Emeritus of Industrial and Systems Engineering*, (1970-93).
SONIAT, Katherine T., M.S., *Associate Professor Emerita of English,* (1991-2007).
SPAHR, Janet E., M.S.L.S., *Assistant Professor Emerita of the University Libraries,* (1970-97).
SPENCER, Chester W., Ph.D., *Roanoke Electric Steel Professor Emeritus of Materials Science and Engineering,* (1976-93).
SPENCER, Elizabeth Ann, M.B.A., *Associate Vice President Emerita of Personnel,* (1979-97).
SPENCER, Norrine Bailey, Ph.D., *Associate Provost and Director Emerita of Undergraduate Admissions,* (1983-2008).
SPENCER, Robert E., M.A., *Associate Professor Emeritus of Mathematics,* (1955-92).
SPENGLER, Manfred L., Ph.D., *Associate Professor Emeritus of Industrial and Systems Engineering*, (1975-00).
SPORAKOWSKI, Michael J., Ph.D., *Professor Emeritus of Human Development*, (1970-00).
SQUIRES, Arthur M., Ph.D., *Univ. Distinguished Professor Emeritus of Chemical Engineering,* (1976-86).
SQUIRES, Michael G., Ph.D., *Professor Emeritus of English*, (1969-02). [2]
STARLING, Thomas M., Ph.D., *W. G. Wysor Professor Emeritus of Agriculture, Agronomy,* (1944-89).
STEEVES, Harrison R., III, Ph.D., *Associate Professor Emeritus of Biology,* (1966-97).
STEPHENS, Carroll U., Ph.D., *Associate Professor Emeritus of Management*, (1993-03).
STEPHENSON, F. William, Ph.D., *Hugh P. and Ethel C. Kelly Professor of Electrical and Computer Engineering and Dean Emeritus of the College of Engineering,* (1978-02).
STEPHENSON, Robert E., M.S.L.S., *Associate Professor Emeritus, Library,* (1949-88).
STETLER, David A., Ph.D., *Associate Professor Emeritus of Biology*, (1973-98).
STEWART, Jeffrey R., Ed.D., *Professor Emeritus of Vocational and Technical Education,* (1957-92).
STEWART, Kent K., Ph.D., *Professor Emeritus of Biochemistry*, (1982-98).
STOECKEL, Jay E., M.Arch., *Associate Professor Emeritus of Architecture,* (1987-04).
STIPES, R. Jay, Ph.D., *Professor Emeritus of Plant Pathology, Physiology and Weed Science,* (1967-02).
STOEVENER, Herbert H., Ph.D., *Professor Emeritus of Agricultural and Applied Economics*, (1980-95).
STONE, Warren Kenneth, Ph.D., *Professor Emeritus of Food Science and Technology,* (1954-78).
STORRIE, Brian, Ph.D., *Professor Emeritus of Biochemistry,* (1976-03).
STOUT, Ernest R., Ph.D., *Professor Emeritus of Biology,* (1967-97).
STROTHER, Shirley C., Ed.D., *Associate Professor Emerita of Family and Child Development,* (1959-89).[1, 3]
STUART, William B., Ph.D., *Professor Emeritus of Forestry,* (1974-99).
STUBBLEFIELD, Harold, Th.D., *Professor Emeritus of Adult Learning and Human Resource Development*, (1973-98).
STUBBS, John Caldwell, Ph.D., *Professor Emeritus of English,* (1989-05).
STUTZMAN, Warren L., Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1969-01).
SULLIVAN, Joseph T., Ph.D., *Joseph H. Collie Professor Emeritus of Chemical Engineering*, 1997-04).
SULLIVAN, William G., Ph.D., *Professor Emeritus of Industrial and Systems Engineering*, (1989-01).
SULLOWAY, Alison G., Ph.D., *Associate Professor Emerita of English,* (1975-85).
SUNDELIN, Ronald M., Ph.D., *Commonwealth Professor Emeritus of Physics*, (1987-02).
SUNSHINE, Donald R., B. Arch, M. Arch., *Professor Emeritus of Architecture*, (1975-99).
SWAIN, Evangeline C., M.S., *Associate Professor Emerita, Cooperative Extension,* (1958-91).
SWANN, Charles W., Ph.D., *Professor Emeritus of Crop and Soil Environmental Sciences*, (1988-03).
SWIFT, George W., Ph.D., *Associate Professor Emeritus of Engineering Science and Mechanics*, (1959-91).
SWIGER, L. A., Ph.D., *Dean Emeritus of the College of Agriculture and Life Sciences*, (1980-03).
SWISHER, Jerry M., Jr., *Senior Extension Agent Emeritus*, (1972-02).
SZELESS, Adorjan G., Ph.D., *Associate Professor Emeritus of Mechanical Engineering,* (1962-92).
TALBUTT, Palmer C. Jr., Ph.D., *Associate Professor Emeritus of Philosophy,* (1959-91).
TAYLOR, Larry T., Ph.D., *Professor Emeritus of Chemistry,* (1967-07).[2,4]
TEATES, Thomas G., Ph.D., *Professor Emeritus of Education,* (1970-95).
TELIONIS, Demetrios P., Ph.D., P.E., *Frank J. Maher Professor Emeritus of Engineering Science and Mechanics*, (1970-2008).
TEODOROVIC, Dusan, Ph.D., Professor Emeritus of Civil and Environmental Engineering, (1999-2005).
THOMAS, Horace R., M.S., *Associate Professor Emeritus of Animal Science,* (1948-80).
THOMPSON, Mary Lippard, M.A., *Associate Professor Emerita of Home Economics,* (1935-63).
THOMSON, James E., Ph.D., *Professor Emeritus of Mathematics*, (1974-99).
THORN, George W., *Professor Emeritus of Theatre Arts*, (1968-98).
THYE, Forrest W., Ph.D., *Associate Professor Emeritus of Human Nutrition, Foods, and Exercise,* (1969-2005).
TIELEMAN, Henry W., Ph.D., *Professor Emeritus of Engineering Science and Mechanics,* (1968-97).
TIPSWORD, Ray F., Ph.D., *Professor Emeritus of Physics,* (1964-91). [2, 3]
TLOU, Josiah S., Ed.D., *Professor Emeritus of Education,* (1978-05).
TODD, Joseph H., III, *Senior Extension Agent Emeritus*, (1973-02).
TORGERSEN, Paul E., Ph.D., *President Emeritus*, (1966-99).
TOTH, Thomas E., Ph.D., Professor Emeritus of Virology, (1983-05).
TRAMEL, James L., Ph.D., *Professor Emeritus of Agronomy,* (1952-90).
TRANT, Doris, M.S., *Senior Extension Agent Emerita,* (1977-05).
TRAUGER, David L., Ph.D., *Professor Emeritus of Natural Resources Management,* (2001-08).
TUCKER, Edward L., Ph.D., *Professor Emeritus of English*, (1960-02).
TURNER, E. Craig Jr., Ph.D., *Professor Emeritus of Entomology,* (1953-92).
TURNWALD, Grant H., Diplomate, A.C.V.I.M., *Professor Emeritus of Small Animal Clinical Sciences,* (1998-2009).
TYREE, Jack M., M.S., *Professor Emeritus, 4-H Extension,* (1950-75).
TZE, Hsiung Chia, Ph.D., *Professor Emeritus of Physics,* (1985-00).
UMBERGER, Steven H., Ph.D., *Extension Director Emeritus,* (1980-05).
VAN KREY, Harry P., Ph.D., *Professor Emeritus of Poultry Science,* (1965-91).
VANLANDINGHAM, Hugh F., Ph.D., *Professor Emeritus of Electrical and Computer Engineering*, (1966-01).
VASEY, Richard B., Ph.D., *Professor Emeritus of Forestry,* (1970-90).
VENTRE, Francis T., *Professor Emeritus of Architecture and Planning*, (1986-93).

VIERS, Jimmy W., Ph.D., *Associate Professor Emeritus of Chemistry,* (1971-05).[2,4]
VINSON, William E., Ph.D., *Professor Emeritus of Dairy Science*, (1971-00).
VOGLER, Daniel E., M.S., *Associate Professor Emeritus in the College of Human Resources and Education*, (1976-98).
WALKER, Richard D., Ph.D., P.E., *Professor Emeritus of Civil Engineering,* (1961-96).
WALL, Vera, J. Ph.D., *Associate Dean Emerita of the College of Human Resources and Education,* (1981-98).
WALLACE, Bruce, Ph.D., *University Distinguished Professor Emeritus of Biology,* (1981-94).
WAMSLEY, Gary L., Ph.D., *Professor Emeritus of Public Administration,* (1977-05).
WARD, Thomas C., Ph.D., *Adhesive and Sealant Council Endowed Professor Emeritus of Chemistry,* (1968-06).[2,3]
WARREN, Herman L., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science*, (1989-03).
WASHENBERGER, James K., Ph.D., *Associate Professor Emeritus of Mathematics,* (1966-07).
WEAVER, William D., Ph.D., *Professor Emeritus of Poultry Science,* (1962-91).
WEBB, Ryland E., Ph.D., *Professor Emeritus of Human Nutrition and Foods,* (1963-96).
WEBER, Larry J., Ph.D., *Professor Emeritus of Education,* (1967-95).
WELLS, Helen, Ph.D., *Associate Professor Emerita of Housing, Interior Design and Resource Management,* (1973-89).
WEST, David A., Ph.D., *Associate Professor Emeritus of Biology*, (1962-98).
WHEARY, Cecil D., B.S., *Associate Professor Emeritus of Agricultural Engineering,* (1938-76).
WHITE, John M., Ph.D., *Professor of Dairy Science and Associate Dean Emeritus of the College of Agriculture and Life Sciences*, (1967-02). [2,3]
WHITE, Marshall S., Ph.D., *Professor Emeritus of Wood Science and Forest Products,* (1975-07).
WHITE, Orion F., Jr., Ph.D., *Professor Emeritus of Public Administration and Policy*, (1980-03).
WHITE, William M., Ph.D., *Professor Emeritus of English,* (1953-90).
WHITELAW, Robert L., M.S., P.E., *Professor Emeritus of Mechanical and Nuclear Engineering,* (1966-87).
WIECZYNSKI, Joseph L., Ph.D., *Professor Emeritus of History*, (1968-99).
WIERWILLE, Walter W., Ph.D., *Professor Emeritus of Industrial and Systems Engineering*, (1971-98).
WIGGERT, James M., Ph.D., *Associate Professor Emeritus of Civil Engineering,* (1961-91).
WIGHTMAN, James P., Ph.D., *Professor Emeritus of Chemistry*, (1962-00).
WILKES, Garth L., Ph.D., *University Distinguished and Fred W. Bull Professor Emeritus of Chemical Engineering*, (1978-03).[6]
WILKINS, Tracy D., Ph.D., *Professor Emeritus of Biochemistry*, (1972-02).
WILLIAMS, Clayton D., Ph.D., *Associate Professor Emeritus of Physics,* (1961-96).
WILLIAMS, George R., M.S., *Professor Emeritus of Horticulture,* (1957-80).
WILLIAMS, Jerry M., Ph.D., *Associate Professor Emeritus of Horticulture,* (1982-2008).
WILLIAMSON, Gustavus G., Ph.D., *Associate Professor Emeritus of History*, (1966-92).
WILLIAMSON, Kenneth Carlton, M.S., *Professor Emeritus of Animal Science*, (1947-82).
WILLIGES, Robert C., Ph.D., *Ralph H. Bogle Professor Emeritus of Industrial and Systems Engineering*, (1976-03).
WILLS, George B., Ph.D., *Professor Emeritus of Chemical Engineering,* (1964-96).
WILLS, Wirt H., Ph.D., *Professor Emeritus of Plant Pathology, Physiology, and Weed Science,* (1954-90).
WILSON, James H., Ph.D., *Professor Emeritus of Biological Systems Engineering*, (1975-02).
WISDOM, Harold W., Ph.D., *Professor Emeritus of Forestry*, (1976-01).
WISMAN, Everett Lee, Ph.D., *Professor Emeritus of Poultry Science,* (1947-86).
WOESTE, Frank E., Ph.D., *Professor Emeritus of Biological Systems Engineering*, (1977-03).
WOLF, Dale Duane, Ph.D., *Professor Emeritus of Agronomy*, (1967-97).
WOLFE, James F., Ph.D., *Professor Emeritus of Chemistry,* (1964-96).
WOLFORD, John H., Ph.D., *Professor Emeritus of Animal and Poultry Sciences, (*1980-95).
WONG, Young-tsu, Ph.D., *Professor Emeritus of History*, (1971-02).[6]
WOOD, Charles B., M.S., *Associate Professor Emeritus of Food Science and Technology,* (1954-81).
WOOD, Henry L., Ph.D., *Professor Emeritus of Mechanical Engineering,* (1946-88).
WOODARD, Janice E., Ph.D., *Associate Professor Emerita of Housing, Interior Design, and Resource Management,* (1969-92).
WORNER, Wayne M., Ed.D., *Professor and Dean Emeritus of the College of Education,* (1971-96).
YARDLEY, Diane W., Ph.D., *Associate Dean Emerita of the College of Human Resources and Education*, (1982-02).
YATES, Charlie L., Ph.D., *Professor Emeritus of Aerospace and Ocean Engineering*, (1987-00).
YEARWOOD, Richard M., Ph.D., *Associate Professor Emeritus of Urban Affairs and Planning*, (1968-98).
YOUNGS, Robert L., Ph.D., *Professor Emeritus of Forestry and Forest Products,* (1985-94).
YOUSTEN, Allan A., Ph.D., *Professor Emeritus of Biology*, (1971-01).
ZALLEN, Richard H., Ph.D., Professor Emeritus of Physics, (1983-05).
ZWEIFEL, Paul F., Ph.D., *University Distinguished Professor Emeritus of Physics,* (1968-95).

Faculty Honors: 2000 - present | 1957 - 1999

Academic Advising Awards

2008: C. Taylor
2007: J. Campbell
2006: J. Mooney
2004: J. Cranford
2003: D.W. Reaves
2002: R. Holloway
2001: S. Ball
2000: D.B. Thorp

Academy of Teaching Excellence

2008: E. Bloomer, J.E. Eddleton, O.H. Griffin, R.F. McDuffie, J.C. Sible, J.D. Stahl
2007: W. Beal, G.H. Becker, G.M. Filz, K.A. Hoffman, M.B. Saffle, E.T. Shugart
2006: M. Barrow, T.M. Gardner, P. Heilker, G.V. Loganathan, F.H. Oehlschlaeger, K. Pelzer
2005: D. Agud, W.T. Baumann, R.J. Foti, A. Kohler, G. Long, P. Sorrentino
2004: A. Colaianne, G. Downey, T. Pratt, C.F. Reinholtz , J.J. Richardson Jr., S. Saffle
2003: A.L. Buikema Jr., D.M. Denbow, R.M. Goff, G. Lloyd, D.W. Reaves, W.E. Snizek
2002: P.G. Amateis, W.M. Aust, R.E. Benoit, J.D. Boyer, R.D. Fell, C.P. Neck
2001: A.O. Abaye, H. Bender, W.W. Brown, S. Magliaro, M. McAllister, M. Vorster
2000: J.T. Arnold, A.S. Becker, J.L. Ozanne, T. Papillon, A.J. Stremmel, B.M. Waggenspack

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Alumni Extension Award

2008: J. Orband, R. Youngman
2007: K. Balderson, M. Weaver
2006: J. Baney, A. Herbert
2005: R. Cox, G.M. Snyder
2004: G. Evanylo, J. Unroe
2003: M.T. Lambur, S.M. Johnson
2002: J.A. Myers, C.C. Stallings
2001: H.W. Pettway, S.S. Sumner
2000: J.A. Martin, R.M. Shaffer

Alumni International Programs Award

2008: J. Browder, D. Gnyawali, G. Snyder
2007: J. Littlefield, T. Ollendick
2006: J. Alwang, G.R. Thompson
2005: V. Fu, D. Kingston
2004: J. Scarpaci
2003: J. Marchman
2002: J.S. Tlou
2001: G.W. Norton
2000: D.E. Egger

Alumni Research Award

2008: X.J. Meng, S.T. Oyama
2007: T. Calasanti, D. Viehland
2006: H. Dorn, M. Edwards, K. Roberto
2005: M.F. Hochella, Jr., M.W. Hyer
2004: R.C. Batra, H.W. Gibson
2003: D. Farkas, D. Lindsay
2002: John G. Casali, Malcolm Potts
2001: E.S. Geller, D.J. Inman
2000: R.M. Akers, L.T. Watson

Alumni Teaching Award

2009: A. Nelson, A. Stevens
2008: O.H. Griffin, J.C. Sible
2007: T.H. Becker, K.A. Hoffman
2006: M. Barrow, F.H. Oehlschlaeger
2005: R.J. Foti, A. Kohler
2004: A. Colaianne, C.F. Reinholtz
2003: G. Lloyd, D.W. Reaves
2002: W.M. Aust, P.G. Amateis
2001: A.O. Abaye, M. Vorster
2000: J.T. Arnold, B.M. Waggenspack

Commonwealth of Virginia Outstanding Faculty

2007: M. A. Edwards, D.T. Zallen
2006: T.M. Murray, P. Sorrentino
2005: R.O. Claus, E.S. Geller, L. Roy
2003: T. Gardner, M. Vorster
2002: J. R. Craig, J.R. Seiler
2001: J.P. Wightman
2000: Y.A. Liu, W. Purcell

Diggs Teaching Scholar

2008: P.S. Polanah, J. Terpenny, Y. White
2007: N. Alexander-Floyd, G. Chandler, B. Murphy
2006: J. Dubinsky, O. H. Griffin, J. Sible
2005: C. Dannenberg, K. Precoda, P. Wallenstein
2004: S. Ball, C. Eckel, S. Johnson, R. Siegle
2003: A. Becker, E. Bloomer, T. Smith-Jackson
2002: M.M. Boler, J.R. Seiler, W.E. Snizek
2001: M.B. Boisen, S. Floyd-Thomas, R. Goff
2000: K. Allen, B. Bunch-Lyons, J. Martin

Alumni Distinguished Professors

J. Bixler, R. Bliesznер, C. Bostian, E.A. Brown, A.L. Buikema, Jr., G. Downey, E.S. Geller, J.I. Robertson, Jr., L.H. Roy, W. Snizek

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University Distinguished Professors

R.J. Bodnar, H.E. Burkhart, G.J. Flick, Jr., N. Giovanni, M. Hochella, D. Kingston, P. Knox, F.C. Lee, T. Luke, J. McGrath, A.H. Nayfeh, T.H. Ollendick, H. Sherali, J.J. Tyson
Honorary Distinguished Professor: M. Grene

Sporn Award

2008: E. Bloomer, M. Paretti
2007: W.E. Beal, Y.A. Liu
2006: P.L. Durrill, P. Heilker
2005: D. Agud, K. Ellis
2004: J. De La Ree Lopez, S. Saffle
2003: W. E. Snizek, E. Scott
2002: J.D. Boyer, J.S. Thweatt
2001: M. McAllister, D.H. Vaughan
2000: W.L. Conger, T. Papillon

University Exemplary Department (recipients for the last five years)

2008
Working collaboratively across departmental boundaries to fulfill common or complementary goals.
Computer Science
Architecture+Design
History and Teaching & Learning
Undergraduate Research Institute

2007
Developing and sustaining innovative and effective departmental approaches to advising at the undergraduate and/or graduate levels.
Industrial and Systems Engineering
Apparel, Housing, and Resource Management
University Academic Advising Center

2006
Developing and sustaining innovative and effective departmental approaches to introductory courses at the graduate or undergraduate levels.
Communication
Engineering Education

2005
Enchancing global diversity by effectively increasing the numbers of culturally different faculty, staff, and students and/or promoting and supporting international and multicultural perspectives to support the missions of the university.
Cranwell International Center
Human Development

2004
Effectively linking research and scholarship with teaching, with particular concentration on innovative undergraduate programs:
Biological Systems Engineering
History
Theatre Arts

Wine Award

2009: C.A. Bailey, J. De La Ree Lopez, J.H. Simonetti
2008: J.E. Eddleton, R.F. McDuffie, J.D. Stahl
2007: G.M. Filz, M.B. Saffle, E.T. Shugart
2006: T.M. Gardner, G.V. Loganathan, K. Pelzer
2005: W.T. Baumann, P. Sorrentino, G. Long
2004: G. Downey, T. Pratt, J.J. Richardson, Jr.
2003: A.L. Buikema, Jr., D.M. Denbow, R.M. Goff
2002: R.E. Benoit, R.D. Fell, C.P. Neck
2001: H. Bender, W.W. Brown, S. Magliaro
2000: A.S. Becker, J.L. Ozanne, A.J. Stremmel

Faculty Honors: 1957 - 1999 | 2000 - present

Academic Advising Awards

1989: S.C. Farrier
1990: W.M. Etgen
1991: J.R. McKenna
1992: R.H. Pusey
1993: M.A. Barnes
1994: J. A. Norstedt
1995: T. O. Sitz
1996: R.T. Jones
1997: L.L. Geyer
1998: R. Dean Riess
1999: D.J. Parrish

Academy of Faculty Service

1986: L.J. Axelson, L.B. Barnett, L.K. Brice, M.B. Boisen, J.D. Eustis, R.F. Dickman, G.A. Gray, P.P. Hale, G.B.Hammond, D.E. Hinkle, P.H. Hoepner, T.C. Hunt, D.M. Kohl, N.R. Krieg, W. Kroontje, K.W. Kubin, A.T. Leighton, R.J.Litschert, J.B. Manheim, J.G. Mason, J.A. Norstedt, J.T. Novak, L.A. Padis, D.J. Parks, J.C. Pitt, K.L. Reifsnider, A. Robeson, J.F. Robinson, P.B. Siegel, G.M. Simmons, P.L.Smeal, L.J. Taper, L.H. Taylor, F.W. Thye, J.M. Wiggert, J.M. White, R.B. Vasey
1987: R.E. Benoit, J.D. Eustis, J.H. Hillison, T.C. Hunt, J.B. Manheim, P.L. Smeal
1988: D. Conn, J.D. Eustis, T.C. Hunt, P. Scanlon, P.L. Smeal, P.S. Zeskind
1989: R.K. Bambach, R. Blieszner, D. Conn, D.R. Farkas, T.C. Hunt, R.S. Purdy, P.F. Scanlon
1990: R.K. Bambach, D.E. Egger, L. Eng, D.R. Farkas, R. Goss, J. Hiller, P. F. Scanlon
1991: R. Bambach, D.E. Egger, L. Eng, D.R. Farkas, L. Geyer, J. Hiller, J. Hillison
1992: S. Arthur, G. Clum, J. Falkinham, L. Geyer, J. Hiller, J. Hillison, J. Woods
1993: J. Baker, D. deWolf, J. Falkinham, L. Geyer, M. Norstedt, P. Sorrentino, J. Woods
1994: C. Carrig, J. Christman, D. deWolf, J. Falkinham, T. Hunt, J. Knight, L. Shumsky, R. Sumichrast
1995: D. Beagle, C. Carrig, J. Christman, D. Creamer, D.R. Farkas, T. Hunt, J. Sawyers, L. Shumsky
1996: M. Boisen, R. Fell, L. Geyer, J. Hiller, T. Hunt, M. Lambur, J. McKenna, P. Metz, T. Rakes, K. Redican, J. Roggenbuck, T. Sherman, E. Tze
1997: M. Boisen, R. Fell, E. Fuhrman, L. Geyer, S. Gustafson, J. Hiller, M. Lambur, S. Magliaro, J. McKenna, P. Metz, K. Redican
1998: R. Fell, E. Fuhrman, L. Geyer, S. Gustafson, M. Lambur, S. Magliaro, K. Redican

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Academy of Teaching Excellence

1974: L.C. Crawford, W.M. Etgen, W.L. Favrao, G.C. Grender, S.M. Holzer, T.D. Hubbard, M. Kosztarab, J.P. McNab, R.P. McNitt, R.J. Nurse, J.J. Owen, J.A. Phillips, G.R. Powley, R.G. Saacke, H.R. Steeves III, L.J. Simutis, J.P. Wightman
1975: A.W. Bennett, L.K. Brice, Jr., L.G. Duenk, J.E. Kaiser, J.F. Keller, L.W. Rutland, Jr., D.A. Stetler, T.C. Ward, J.M. White
1976: J.R. Craig, G.V. Gibbs, J.B. Jones, W.D. Lowry, J.W. Maxwell, Jr., A.H. Nayfeh, J.T. Regan, R.B. Vasey, J.F. Wolfe
1977: E.W. Carson, Jr., O.C. Ferrari, R.H. Giles, Jr., T.H. Hohenshil, E.C. Houck, T.C. Hunt, L.D. Mitchell, R.H. Myers, M.G. Squires, L.T. Taylor
1978: T.W. Bonham, C.W. Bostian, J.A. Jacobs, J.W. Looney, W.L. Mauldin, J.C. Pitt, D.F. Scott, Jr., R.F. Tipsword, J.W. Viers, G.B. Wills
1979: P.F. Anderson, G.B. Hammond, S.M. Holzer, D.E. Kenyon, P.L. Martin, J.A. Niles, M.A. Ogliaruso, R.H. Plaut, J.F. Robinson, G.M. Simmons, Jr.
1980: L.L. Grigsby, D.E. Hutchins, A.J. Keown, M.R. Louthan, L.D. Mitchell, R.H. Myers, F. Ruiz, R.S. Schulman, W.E. Snizek
1981: L.O. Bishop, G. Fenstermacher, D. Kohl, P. McGovern, W. Purcell, J.I. Robertson, J. Taper
1982: J.B. Birch, C.W. Bostian, D.E. Kenyon, N.D. Smith, J.W. Via
1983: E.S. Geller, D.E. Hinkle, H.M. McNair, H.W. Munson
1984: R.E. Benoit, P.P. Kelly, D.D. Ludwig, P.M. Sorrentino
1985: R.F. Kelly, L.G. Kraige, J.J. Owen, C.M. Reed, L.P. Rees, P.S. Zeskind
1986: S.H.J. Adams, R.V. Lalik, M.R. Louthan, Jr., R.S. Purdy, D.A. Stetler, R.F. Tipsword
1987: C.J. Dudley, D.E. Egger, J.W. Knight, A.B. Mandelstamm, D.J. Schneck, J.D. Stahl
1988: A. Buikema, T.W. Luke, J.K. Sawyers, J.L. Schrum, E.D. Stump, G.R Thompson
1989: M.A. Barnes, M.B. Boisen, Jr., G.W. Justice, K.B. Monroe, W.E. Snizek, D.A. West
1990: J.D. Arthur; W.E. Beal; A.A. Fernandez-Vasquez; E.S. Geller; G.M. Graham; L.H. Roy
1991: C.J. Burger, J.R. Crunkilton, T.M. Gardner, J.B. Howard, D.D. Long, M.S. Leib
1992: C.A. Bailey, R.A. Martin, T.R. Rakes, C.F. Reinholtz, J.C. Ulloa, E. Weisband
1993: J. Birch, V. Bonomo, S. Magliaro, M. Norton, D. Rubenstein, H. Sherali
1994: P. Amateis, J. Bixler, J.E. LaPorte, J. McKenna, R. Plaut, P. S. Zeskind
1995: K. Allen, E. Fuhrman, A. Keown, H. Munson, B. Reed, J. Wightman
1996: A. Buikema, J. Glanville, R. Lyons, P. Mellen, M.B. Oliver, K. Singh
1997: S.A. Johnston, Y.A. Liu, J.S. Merola, C.S. Rogers, J. R. Seiler, E.T. Shugart
1998: R. Blieszner, E. A. Brown, M. J. Ellerbrock, V. R. Fu, T.W. Luke
1999: S.D. Forrester, C.E. Frazier, E.S. Geller, B.J. Smith, D.W. Smith, J.R. Voshell

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Alumni Extension Award

1976: G.A. Allen
1977: D. A. Dyer
1978: B.S. Mifflin
1979: B.S. Blanchard
1980: K.C. Williamson
1981: C.D. Allen
1982: A.L. Eller
1983: G.J. Flick
1984: A.N. Huff
1985: J. A. Barton, J.P. Marshall
1986: R.L. Wesley, H. E. White
1987: G.M. Jones, J.B. Bell
1988: H. J. Gerken, Jr., W.H. Robinson
1989: G.W. Hawkins, K.H. Martin
1990: J.L. Jones, J.S. Huddleston
1991: J.R. Hall III, N.G. Marriott
1992: D.E. Brann, C.W. Coale
1993: M.W. Grizzard, E.S. Hagood
1994: P. M. Phipps, T. E. Rippen
1995: C. R. Hackney, J. C. Maitland
1996: C.W. Swann, J.M. Swisher, Jr.
1997: M. J. Clifford, B. W. Zoecklin
1998: H. L. Haney, Jr., R. A. Nunally
1999: G.P. Dingus, R.R. Meadows

Alumni International Programs Award

1997: J. S. Caldwell
1998: Philip Y. Huang
1999: J.A. Ballweg

Alumni Research Award

1976: C.H. Domermuth, C.S. Douglas, R.T. DuBose, W.B. Gross
1977: C.W. Smith
1978: D.G. Cochran
1979: W.E.C. Moore
1980: L.W. Mo
1981: L. Meirovitch
1982: K.L. Reifsnider
1983: M.H. Ross
1984: W.S. Saric
1985: F.S. Quinn, J.N. Reddy
1986: L.T. Kok, J.P. Fontenot
1987: E. T. Kornegy, R.H. Plaut
1988: H.E. Burkhart, H.F. Brinson
1989: D. Post, G.L. Wilkes
1990: R.A. Arndt, F.C. Lee
1991: D.G. Baird, R.J. Bodnar
1992: R.T. Haftka, J.J. Tyson
1993 J.E. McGrath, M. Renardy
1994: R. O. Claus, Y. Wong
1995: W. H. Velander, R-H Yoon
1996: T.S. Rappaport, H.D. Sherali
1997: J.A. Ball, C. R. Fuller
1998: S. B. Desu, J. A. Schetz
1999: N. Castagnoli, R.A. Winett

Alumni Teaching Award

1982: J.B. Birch, N.D. Smith
1983: E.S. Geller, H.M. McNair
1984: R.E. Benoit, P.M. Sorrentino
1985: J.C. Pitt, C.M. Reed, Jr.
1986: S.J. Adams, R.S. Purdy
1987: C.J. Dudley, J.D. Stahl
1988: J. K. Sawyes, E.D. Stump
1989: G.W. Justice, W.E. Snizek
1990: J.D. Arthur, L.H. Roy
1991: J.R. Crunkilton, T.M. Gardner
1992: C.A. Bailey, J.C. Ulloa
1993: S.G. Magliaro, H.D. Sherali
1994: J. E. Bixler, P. S. Zeskind
1995: E. R. Fuhrman, A. J. Keown
1996: A.L. Buikema, M.B. Oliver
1997: J.S. Merola, E.T. Shugart
1998: R. Blieszner, T. W. Luke
1999: B.J. Smith, J.R. Voshell

Commonwealth of Virginia Outstanding Faculty

1987: W.R. Knocke, J.J. Owen, F.S. Quinn
1988: H.E. Burkhart, L.G. Kraige
1989: S.M. Holzer
1991: J.I. Robertson, W.B. Snizek
1993: H.D. Sherali
1996: J. R. Martin II
1997: C.R. Hackney
1998: R.H. Plaut

Diggs Teaching Scholar Awards

1992: J.E. Bixler, E. Brown, J.W. Knight
1993: G. Bauer, G.W. Justice, L. Neilson
1994: T.M. Gardner, S.M. Holzer, A.G. Kilkelly
1995: E. Bounds, A.L. Buikema, T.M. Wildman
1996: B. Carlisle, J.R. McKenna, N.A. Metz
1997: E.A. Brown, G.L. Downey, T.L. Papillon
1998: C. Burch Brown, W. Greenberg, L.B. Plaut
1999: R.G. Kander, M.E. Schneider, B.W. Winkel-Shirley

Sporn Award

1966: L.K. Brice, F.R. DeJarnette
1967: R.T. Davis, R.T. Robertson
1968: J. Counts, R.B. Holliman
1969: J.P.H. Mason, Jr., E.F. Furtsch
1970: G.C. Grender, R.M. Barker
1971: L.W. Rutland, J.E. Kaiser, Jr.
1972: M.E. Wright, J.J. Owen
1973: R.J. Nurse, L.D. Mitchell
1974: S.M. Holzer, H.R. Steeves
1975: W.W. Stinchcomb, D.A. Stetler
1976: W.L. Hallauer, Jr., J.R. Craig
1977: T.E. Bechert, L.T. Taylor
1978: L.G. Kraige, J.W. Viers
1979: M.R. Louthan, Jr., G.M. Simmons, Jr.
1980: J. Roche, Jr., R. P. Davis
1981: H.W. Munson, W.D. Purcell
1982: J.W. Via, R.M. Goff
1983: H.W. Munson, C.E. Nunnally
1984: D.D. Ludwig, R.O. Claus
1985: P.S. Zeskind, M.R. Louthan, Jr.
1986: M.J. Caputi, D.A. Stetler
1987: A.B. Mandelstamm, W.F. Ng
1988: A.L. Buikema, D.H. Morris
1989: H. W. Munson, D.A. West
1990: E.S. Geller, P.T. Kemmerling
1991: C.J. Burger, C.P. Koelling
1992: P.E.Torgersen, E. Weisband
1993 : R.G. Kander, D. Rubenstein
1994: P. Amateis, S. L. Kampe
1995: J. P. Wightman, G-Q Lu
1996: J.O. Glanville, Y.A. Liu
1997: C.S. Rogers, S.C. Sarin
1998: Michael J. Ellerbrock, Curtis H. Stern
1999: T.R. Chang, C.E. Frazier

University Public Service Award

1995: W. Kerns, D.G. Larsen
1996: C.W. Randall
1997: W. D. Whittier
1998: R. M. Chandler
1999: A. Keown

Wine Award

1957: G.R. Powley, P.M. Reaves, R.C. Krug
1958: W.L. Gibson, Jr., A.B. Massey, J.F. Poulton
1959: D.L. Kinnear, H.Y. Loh, H.L. Wood
1960: L. McFadden, F.J. Maher, G.W. Litton
1961: O. Glisson, M.H. Agee, L.K. Brice, D.F. Watson
1962: H.S. Miles, Jr., D.M. Kohler, J.M. Barringer, Jr.
1963: E.C. Marsh, H.S. Mosby, L.A. Padis
1964: E.F. Furtsch, E.P. Ellison, E.M. Jennelle
1965: S.C. Andrews, P.H. Hoepner, P.L. Martin
1966: S.C. Farrier, J.H. Sword, E. Weinstock
1967: H.A. Elarth, M. Kosztarab, N.R. Krieg
1968: R.H. Bond, R.K. Coe, J.F. Wolfe
1969: J.A. Gaines, T.D. Hubbard, F.H. Lutze
1970: G.H. Beyer, O.C. Ferrari, P.A. Distler
1971: R.B. Holliman, W. Kroontje, K. Philson
1972: W.L. Favrao, R.P. McNitt, J.P. Wightman
1973: V.C. Brenner, W.M. Etgen, G.C. Grender
1974: L.C. Crawford, J.A. Phillips, R.G. Saacke
1975: J.E. Kaiser, Jr., T.C. Ward, J.M. White
1976: G.V. Gibbs, J.B. Jones, J.T. Regan
1977: R.H. Giles, Jr., E.C. Houck, T.C. Hunt
1978: G.B. Wills, D.F. Scott, Jr., J.A. Jacobs
1979: S.M. Holzer, P.F. Anderson, J.A. Niles
1980: L.L. Grigsby, R.H. Myers, W.E. Snizek
1981: G.D. Fenstermacher, J.I. Robertson, Jr., F. Ruiz
1982: C.W. Bostian, D.E. Kenyon, A.J. Keown
1983: D.E. Hinkle, D.M. Kohl, L.J. Taper
1984: P.P. Kelly, L.G. Kraige, M.A. Ogliaruso
1985: R.F. Kelly, J.J. Owen, L.P. Rees
1986: R. Lalik, M.R. Louthan, Jr., R.F. Tipsword
1987: D.E. Egger, J.W. Knight, D.J. Schneck
1988: T.W. Luke, J.L. Shrum, G.R. Thompson
1989: M.A. Barnes, M.B. Boisen, Jr., K.B. Monroe
1990: W.E. Beal, A.A. Fernandez-Vazquez, G.M. Graham
1991: J.B. Howard, D.D. Long, M.S. Leib
1992: R.A. Martin, T.R. Rakes, C.F. Reinholtz
1993: J.B. Birch, V.A. Bonomo, M.J.T. Norton
1994: J. E. LaPorte, J. R. McKenna, R. H. Plaut
1995: K. R. Allen, H. W. Munson, B. E. Reed
1996: R. E. Lyons, P.A. Mellen, K. Singh
1997: S.A. Johnston, Y.A. Liu, J.R. Seiler
1998: E. A. Brown, V. R. Fu, R. G. Kander
1999: S.D. Forrester, E.S. Geller, D.W. Smith

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- Sexual harassment is defined as unwelcome sexual advances, request for sexual favors, and other verbal, nonverbal, or physical conduct of a sexual nature when:

    1. submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or academic decisions, or
    2. submission to or rejection of such conduct by an individual is used as the basis for employment or academic decisions, or
    3. such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment.

- Faculty, staff, students, and applicants for employment or admission with complaints of sexual harassment should contact the University EO/AA Office on a confidential basis and request an informal investigation.
- Faculty, staff, and students may file formal complaints outside the university. Students may file formal complaints with the Office of Civil Rights of the Department of Education. Faculty may file formal complaints with the Equal Employment Opportunity Commission. Staff may contact the State EEO Office or the Equal Employment Opportunity Commission.

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