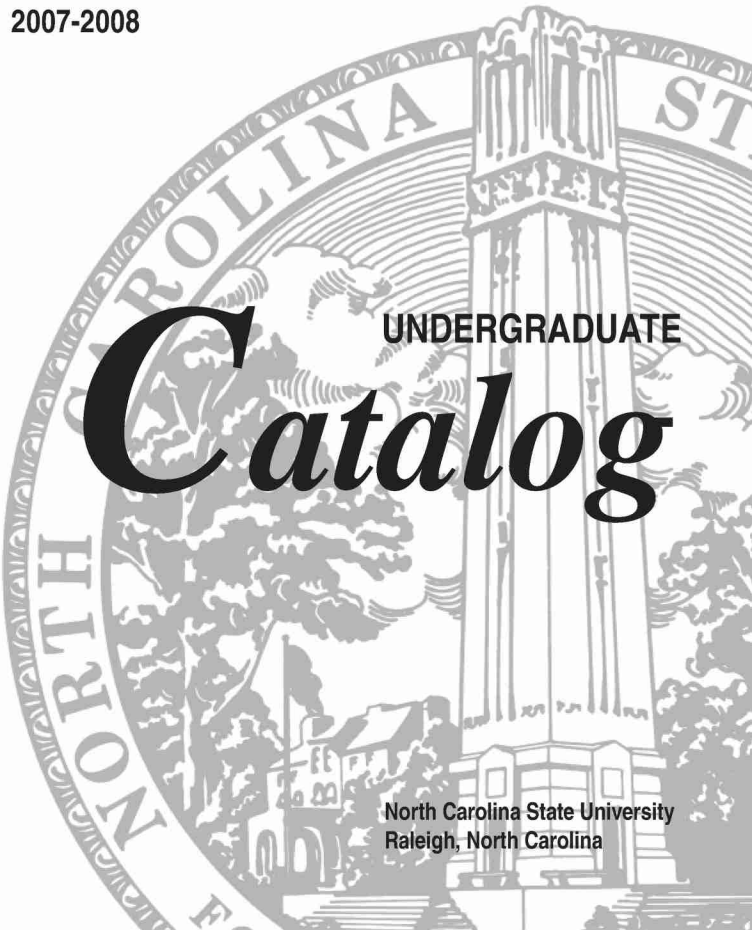
NC STATE UNIVERSITY

2007-2008

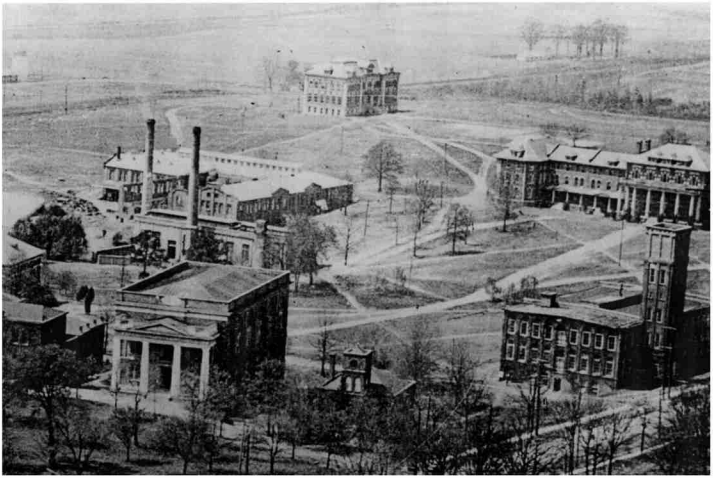


UNDERGRADUATE

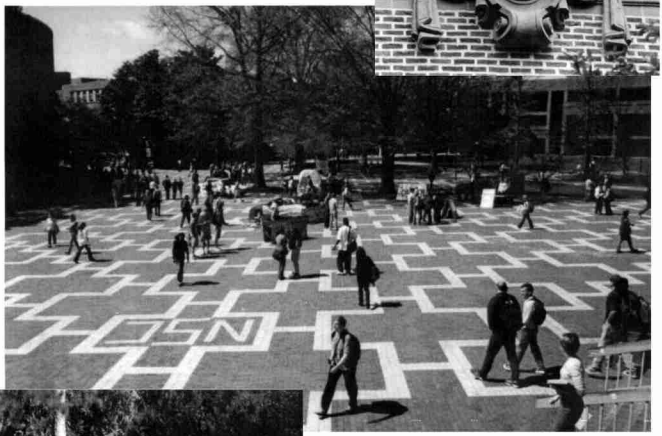
Catalog

North Carolina State University
Raleigh, North Carolina

NORTH CAROLINA STATE UNIVERSITY



Founded 1887



GENERAL INFORMATION

Introduction

North Carolina State University is a national center for research, teaching, and extension in the sciences and technologies, in the humanities and social sciences, and in a wide range of professional programs.

Founded March 7, 1887, by the North Carolina General Assembly under the provisions of the national Land-Grant Act, the university has marked more than a century of service to the state and nation. Sharing the distinctive character of land-grant universities nationwide, NC State has broad academic offerings, national and international linkages, and large-scale outreach, extension, and research activities.

North Carolina State University Historical Sketch

On March 7, 1887, the North Carolina General Assembly passed the act that authorized the establishment of the North Carolina College of Agriculture and Mechanic Arts. The Watauga Club of Raleigh and the statewide farmers' movement had convinced the legislature of the need to transfer the funds received by the state under the provisions of the Morrill Land-Grant Act of 1862 from the University of North Carolina in Chapel Hill to a new land-grant college in Raleigh. The cornerstone of A. and M. College was laid in August 1888, and its doors were officially opened on October 3, 1889.

Alexander Q. Holladay, the college's first president (1889-1899), and a faculty of five offered courses in agriculture, horticulture, pure and agricultural chemistry, English, bookkeeping, history, mathematics, physics, practical mechanics, and military science. The first freshman class numbered about fifty students. By the end of the institution's first decade, the resident enrollment had reached 300.

During the administration of **George T. Winston** (1899-1908) a new curriculum in textiles was developed, and normal courses were offered in the summer for public school teachers, both men and women. The Agricultural Extension Service was established during the administration of **Daniel H. Hill** (1908-1916), and enrollment grew to more than 700. In 1917, during the administration of **Wallace C. Riddick** (1916-1923), the institution's name was changed to North Carolina State College of Agriculture and Engineering. The introduction of the word 'engineering' was intended to reflect the increasing emphasis on the professional and theoretical as well as the practical aspects of technical education.

In 1923, a major reorganization of the administration of the college began, and President Riddick resigned to become the first dean of the new School of Engineering. **Eugene Clyde Brooks** (1923-1934), the fifth president of State College, continued the reorganization with the creation of the School of Agriculture (later named the School of Agriculture and Forestry), the School of Science and Business, the School of Education, the School of Textiles, and the Graduate School. Resident enrollment rose to nearly 2,000 in 1929 before the Depression caused enrollment to drop to approximately 1,500 in 1933. The first women graduates of State College received their degrees in 1927.

In the midst of the Depression, the General Assembly of 1931 attempted to promote economy and prevent unnecessary duplication among the three leading state institutions of higher education by establishing a single consolidated administration for the University of North Carolina in Chapel Hill, North Carolina State College of Agriculture and Engineering, and North Carolina College for Women in Greensboro. Dr. Frank Porter Graham, president of the University of North Carolina, was elected president of the consolidated university, and Dr. Brooks, with the title of vice president, continued as chief administrative officer at State College. Among the consequences of consolidation were the phasing out of the School of Engineering at Chapel Hill and the School of Science and Business at Raleigh. A general college, later called the Basic Division, was established to provide two years of basic courses in the humanities, social sciences, and natural sciences as a foundation for students in the various degree-granting technical and professional schools.

Colonel John W. Harrelson (1934-1953), Class of 1909, was the first alumnus to become administrative head of State College. Under the consolidated organization, his title was Dean of Administration; later it was changed to Chancellor. During Harrelson's administration, the institution experienced the beginning of extraordinary growth in the aftermath of World War II. Two new schools were established: the School of Design and the School of Forestry (now Natural Resources). A multimillion-dollar expansion program was completed during the administration of **Carey H. Bostian** (1953-1959), and the program of student activities was greatly enlarged as the enrollment passed 5,000.

The faculty and student population more than doubled during the administration of **John T. Caldwell** (1959-1975), and another new school was organized: the School of Physical Sciences and Applied Mathematics (now Physical and Mathematical Sciences). The School of General Studies, the successor to the Basic Division, was renamed the School of Liberal Arts and was authorized to offer a full range of bachelor's and master's degree programs in the humanities and social sciences. The name of the institution itself was changed in 1965 to North Carolina State University, signifying its new role as a comprehensive university.

NC State's enrollment rose to 20,000 during the administration of Chancellor **Joab L. Thomas** (1976-1981). The School of Veterinary Medicine was established, the name of the School of Liberal Arts was changed to School of Humanities and Social Sciences, and North Carolina State University was recognized as one of two major research universities within the statewide University of North Carolina system.

Bruce R. Poulton (1982-1990) became chancellor in the fall of 1982. A major expansion of the university's research budget, the establishment of a substantial endowment to provide enlarged resources for research equipment and endowed professorships, and the

addition of the 1,000 acre Centennial Campus occurred during this administration. All of the schools were renamed colleges except for the School of Design and the Graduate School. In addition, the School of Education became the College of Education and Psychology.

In 1990, **Larry K. Monteith** (1990-1998), an alumnus and former Dean of the College of Engineering, became chancellor and NC State's 11th chief administrative officer. Among his early initiatives were the creation of the Division of Undergraduate Studies and the First Year Experience Program. In 1992, the College of Management was established, and plans for a freshman college were formalized. An Institutional Advancement Division, now known as University Advancement, was organized to include alumni relations, university relations, development, and advancement services. A Board of Visitors was created, comprised of nationally prominent scholars, and business leaders, to advise the chancellor and Board of Trustees. The College of Textiles and ABB (Asea Brown Boveri), NC State's first corporate partner, moved to Centennial Campus in 1991. Since then, Centennial Campus surpassed the $100 million mark in construction. In 1994, NC State was authorized to establish the Zeta Chapter of the Phi Beta Kappa Society.

On August 1, 1998, **Marye Anne Fox** (1998-2004), a chemist and member of the National Academy of Sciences, became NC State University's 12th chancellor. Chancellor Fox was the first woman to hold this position at NC State. Chancellor Fox focused on building the campus community, promoting partnerships, and adopting a business model that works. She cochaired the first National Academy of Sciences symposium ever held at NC State and encouraged further growth on the university's Centennial Campus. The number of corporate and government partners with a presence on Centennial Campus grew from 21 in 1998 to around 60 in 2004, including many of the 48 start-up companies based on faculty research. NC State holds 408 patents for inventions and discoveries - 212 of them - or more than half - were awarded to the university since the start of the 1998-99 fiscal year, when Dr. Fox assumed the position of chancellor.

On January 1, 2005, **James L. Oblinger**, provost and executive vice chancellor of NC State, became the university's 13th chancellor. Oblinger served as dean and executive director for agricultural programs of the College of Agriculture and Life Sciences before he was named provost in 2003. Under his leadership, NC State has continued its historical tradition of teaching, research, extension, engagement, and economic development. In 2006, the Achieve! Capital Campaign surpassed its goal of $1 billion 19 months early, placing the university among a select group of institutions ever to have reached a billion dollars. NC State launched "Pack Promise," a student success plan that provides full financial aid as well as academic advising and undergraduate research opportunities to students with the greatest financial need. The program enrolled 316 students during its inaugural year. In addition, the university received a record 15,236 applications for freshman admission in 2006, the largest number of applicants in school history. Also in 2006, the E. Carroll Joyner Visitor Center opened as the university's new "front door" and the Dorothy and Roy Park Alumni Center opened as the new home for NC State Alumni. In his second year as chancellor, Oblinger continues his vision of scholarship for the 21st century, innovation, diversity and inclusiveness and efficiency and effectiveness.

Mission of North Carolina State University*

The mission of North Carolina State University is to serve its students and the people of North Carolina as a doctoral, research-extensive, land-grant university. Through the active integration of teaching, research, extension and engagement, North Carolina State University creates an innovative learning environment that stresses mastery of fundamentals, intellectual discipline, creativity, problem solving, and responsibility. Enhancing its historic strengths in agriculture, science, and engineering with a commitment to excellence in a comprehensive range of academic disciplines, North Carolina State University provides leadership for intellectual, cultural, social, economic and technological development within the state, the nation, and the world.

**Approved by the UNC Board of Governors on September 14, 2001*

Campus

NC State University is located west of downtown Raleigh on 2,240 acres. The campus acreage includes Centennial Campus on 1,130 acres and West Campus at 400 acres. The College of Veterinary Medicine and the stadium/arena complex are located on the West Campus. Nearby are research farms; biology and ecology sites; genetics, horticulture, and floriculture nurseries and forests that comprise an additional 2,700 acres. Elsewhere across the state are research farms, 4-H camps and a research forest for a total of 106,500 acres.

Research Triangle Park

NC State is one of the three Triangle area top-tier research universities along with Duke University in Durham and the University of North Carolina at Chapel Hill. Within the 30 mile triangle formed by the three universities is The Research Triangle Park, a 7,000-acre research park founded in 1959 by leaders from academia, business and government. Today, The Research Triangle Park is home to some of the most innovative and cutting-edge research based companies in the world.

Faculty

The university has approximately 8,573 employees, including 1,843 instructional faculty. Among the many honors and recognitions received by members of the faculty are nine memberships in the National Academy of Sciences and eight memberships in the National Academy of Engineering, one member of the Institute of Medicine, and over 450 members of the Academy of Outstanding Teachers.

Teaching and Research

The university is organized into ten colleges, the Graduate School, and the Division of Undergraduate Academic Programs. The colleges are Agriculture and Life Sciences, Design, Education, Engineering, Humanities and Social Sciences, Management, Natural Resources, Physical and Mathematical Sciences, Textiles, and Veterinary Medicine. These colleges offer baccalaureate degrees in 103 fields, master's degrees in 110 fields, doctoral degrees in 61 fields, and 1 Doctor of Veterinary Medicine Program. Together with more than 60 research centers and institutes, these colleges also support a broad spectrum of more than 3,700 sponsored scholarly endeavors.

Outreach and Extension Program

As North Carolina's flagship research intensive, community engaged land-grant university, NC State has a unique mission to serve the citizens of this state through technical assistance, professional development, lifelong education, technology transfer, and other means of applying knowledge to real world issues and problems. Faculty, students, and staff from all ten academic colleges and other units engage in collaborative research, learning, and service partnerships with business, industry, government, and communities, in the Triangle region and across the state. Extension and engagement imperatives include economic development, environmental stewardship, K-12 education, leadership development, and entrepreneur support. NC State's Office of Extension, Engagement, and Economic Development reaches over one million citizens annually through Cooperative Extension, Industrial Extension, McKimmon Center for Extension and Continuing Education, NC State's Economic Development Partnership, the General Hugh Shelton Leadership Iniative, and the North Carolina Small Business and Technology Development Center.

Students

In the 2006 Fall Semester, the university's head count enrollment totaled 31,130. Included in this number were 21,438 students in undergraduate degree programs, 6,176 in graduate degree programs, 304 First Professional and 3,212 non degree-seeking students. The combined undergraduate and graduate enrollments by college were: Agriculture and Life Sciences - 5,124; Design - 685; Education - 1,552; Engineering - 7,467; Natural Resources - 1,183; Humanities and Social Sciences - 4,832; Management - 2,805; Physical and Mathematical Sciences - 1,608; Textiles - 864; Veterinary Medicine - 381, and Undergraduate Academic Programs/ First Year College - 1,417. The student population included 2,773 African American students, 2,376 other minority students and 13,719 female students. Students at the university come from 50 states, four United States territories, and approximately 99 foreign countries. The international enrollment is a distinctive feature of the institution as nearly 1,891 international students give the campus a cosmopolitan atmosphere.

Associations

The university is a member of the National Association of State Universities and Land-Grant Colleges, the American Council on Education, the Association of Governing Boards of Universities and Colleges, the Oak Ridge Associated Universities, the North Carolina Association of Colleges and Universities, Campus Compact, and the Cooperating Raleigh Colleges.

Accreditation

NC State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award associate's, baccalaureate, master's and doctoral 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 NC State University. In addition, many of the university's professional programs and departments are accredited by national professional associations, including:

Association	Year Accredited
Accreditation Association for Ambulatory Health Care	2004
Accreditation Board for Engineering and Technology	2005
Accreditation Council for Cooperative Education	2001
American Apparel and Footwear Association	2005
American Chemical Society	2002
American Psychological Association	2002
American Veterinary Medical Association Council on Education	2000
Association to Advance Collegiate Schools of Business	2000
Commission on Office Laboratory Assessment	2006
Council for Accreditation of Counseling and Related Educational Programs	2005
Council on Social Work Education	2003
Human Factors in Ergonomics Society	1997
International Association for Continuing Education and Training	2002
Landscape Architectural Accreditation Board	2004
National Architectural Accreditation Board	2006
National Association for Schools of Art and Design	2001

National Association of School Psychology	2000
National Association of Schools of Public Affairs and Administration	2000
National Collegiate Athletic Association	2004
National Council for Accreditation of Teacher Education	2002
National Recreation and Park Association	2002
Professional Golf Association	2005
Society of American Foresters	2005
Society of Wood Science and Technology	2005

Equal Opportunity and Non-Discrimination Policy

It is the policy of the State of North Carolina to provide equality of opportunity in education and employment for all students and employees. Accordingly, the university does not practice or condone unlawful discrimination in any form against students, employees or applicants on the grounds of race, color, religion, creed, sex, national origin, age, disability, or veteran status. Nor does the university allow discrimination on the basis of sexual orientation,* with respect to internal university matters that do not contravene federal or state law and do not interfere with the university's relationships with outside organizations, including the federal government, the military, ROTC, and private employers.

Discrimination based upon race, color, religion, sex, national origin, age, disability, or veteran status is in violation of federal and state law and North Carolina State University policy, and will not be tolerated.

Retaliation against any person complaining of discrimination is in violation of federal and state law and North Carolina State University policy, and will not be tolerated.

North Carolina State University will respond promptly to all complaints of discrimination and retaliation. Violation of this policy can result in serious disciplinary action up to and including expulsion for students or discharge for employees. Disciplinary action for violations of this policy will be the responsibility of the dean or director, supervisor, or Office of Student Conduct as may be appropriate in accordance with applicable procedures.

North Carolina State University hereby affirms its desire to maintain a work environment for all employees and an academic environment for all faculty and students that is free from all forms of unlawful discrimination and free from discrimination which is otherwise prohibited by university policy or regulation. Unlawful discrimination is completely incompatible with the values and goals of North Carolina State University and will not be tolerated. North Carolina State University strives to maintain an environment that supports and rewards individuals on the basis of such relevant factors as ability, merit, and performance.

Every individual is encouraged, and should feel free, to seek assistance, information, and guidance from their department head, or the Office for Equal Opportunity should s/he have questions about the Equal Opportunity and Nondiscrimination Policy.

For more information, please contact:

The Office for Equal Opportunity
1 Holladay Hall
Box 7530, NC State University
Raleigh, NC 27695-7530

phone: (919) 515-3148
fax: (919) 513-1428
TTY: (919) 515-9617
website: www.ncsu.edu/equal_op

*The NC State University equal opportunity and nondiscrimination policy includes transsexual individuals within the policy's prohibition against discrimination on the basis of sex. This includes actual or perceived gender identity and gender expression. See *Price Waterhouse v. Hopkins, 490 U.S. 228 (1989); Smith v. City of Salem, 378 F. 3d 566 (6th Cir. 2004).*

ADMINISTRATION AND OFFICES

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James L. Oblinger, *Chancellor*
PJ Teal, *Assistant to the Chancellor and Secretary of the University*
Kevin Howell, *Assistant to the Chancellor for External Affairs*
Frances Milks, *Assistant to the Chancellor*
Odessa Montgomery, *Assistant to the Chancellor for Communications*

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Katie B. Perry, *Senior Vice Provost*
Jose A. Picart, *Vice Provost for Diversity and African-American Affairs*
Joanne G. Woodard, *Vice Provost for Equal Opportunity and Equity*
Thomas E. H. Conway, Jr., *Dean of Undergraduate Academic Programs*
Samuel F. Averitt, *Vice Provost for Information Technology*
Susan K. Nutter, *Vice Provost and Director, NCSU Libraries*
Thomas K. Miller, *Vice Provost for Distance Education and Learning Technology Applications*
Louis D. Hunt, Jr., *Vice Provost for Enrollment Management and Services and University Registrar*
Bialian Li, *Vice Provost for International Affairs*

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Kenneth L. Esbenshade, *Associate Dean and Director for Academic Programs*
Jon F. Ort, *Associate Dean, Cooperative Extension Service*
Steven Leath, *Associate Dean and Director, Agricultural Research Service*
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Brenda Alston-Mills, *Assistant Dean for Diversity*
Larry A. Nelson, *Coordinator of International Programs*
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College of Design

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Dottie Haynes, *Assistant Dean for Administration*

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Jerome P. Lavelle, *Assistant Dean, Academic Affairs*

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Adalia A. "Jessie" Sova, *Assistant Dean, Finance and Administration*
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Dennis Norris, *Director*
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Stan North Martin, *Director*
High Performance and Grid Computing
Mladen Vouk, *Director*
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Alan Galloway, *Director*

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Michael J. Bustle, *Associate Vice Provost for International Affairs*

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Study Abroad Office
Ingrid R. Schmidt, *Director*
North Carolina Japan Center
Betsy Brown, *Director*
Confucius Institute at NC State University
Sarah H. Cao, *Deputy Director*

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Center for Urban Affairs and Community Services
Yvonne Brannon, *Director*
Continuing and Professional Education
Jud Hair, *Director*
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Tricia Inlow-Hatcher, *Director*

The NCSU Libraries

Susan K. Nutter, *Vice Provost and Director of Libraries*

Office of Research and Graduate Studies

John G. Gilligan, *Vice Chancellor*
Matthew K. Ronning, *Associate Vice Chancellor for Sponsored Programs and Regulatory Compliance Services*
Steven Lommel, *Assistant Vice Chancellor for Research Development*
Bill Houghteling, *Interim Director of the Office of Technology Transfer*
David Winwood, *Associate Vice Chancellor for Technology Development and Innovation*
Terri Lomax, *Associate Vice Chancellor and Dean of the Graduate School*

University Advancement

Terry Wood, *Vice Chancellor*

Advancement Services
Paul Eberle, *Associate Vice Chancellor*
Alumni Relations
Lennie Barton, *Associate Vice Chancellor*
Public Affairs
Deborah Griffith, *Associate Vice Chancellor*
University Development
Ken Sigmon, *Interim Associate Vice Chancellor*

University Planning and Analysis

Karen P. Helm, *Director*

ACADEMIC CALENDAR

2007 Fall Semester

August	22	Wednesday	First day of classes
September	3	Monday	Holiday (Labor Day); university closed
October	11 - 12	Thur - Fri	Fall break; no classes
November	21 - 23	Wed - Fri	Thanksgiving vacation; no classes
November	22 - 23	Thur - Fri	Thanksgiving holiday; university closed
December	7	Friday	Last day of classes
December	10 - 18	Mon - Tues	Final examinations
December	19	Wednesday	Fall graduation exercises
Dec - Jan	24 - 1	Mon - Tues	Winter holiday; university closed

2008 Spring Semester

January	9	Wednesday	First day of classes
January	21	Monday	Holiday (Martin Luther King, Jr. Day); university closed
March	3 - 7	Mon - Fri	Spring break; no classes
March	21	Friday	Spring holiday; no classes
April	25	Friday	Last day of classes
April - May	28 - 6	Mon - Tues	Final examinations
May	10	Saturday	Spring commencement

2008 First Summer Session

May	19	Monday	First day of classes
May	26	Monday	Holiday (Memorial Day); university closed
June	20	Friday	Last day of classes
June	23 - 24	Mon - Tues	Final examinations

2008 Second Summer Session

July	8	Tuesday	First day of classes
August	8	Friday	Last day of classes
August	11 - 12	Mon - Tues	Final examinations

2008 Fall Semester

August	20	Wednesday	First day of classes
September	1	Monday	Holiday (Labor Day); university closed
October	9 - 10	Thur - Fri	Fall break
November	26 - 28	Wed - Fri	Thanksgiving vacation; no classes
November	27 - 28	Thur - Fri	Thanksgiving holiday; university closed
December	5	Friday	Last day of classes
December	8 - 16	Mon - Tues	Final examinations
December	17	Wednesday	Fall graduation exercises
Dec - Jan	24 - 2	Mon - Wed	Winter holiday; university closed

Note: Dates in this publication are those that have been approved by appropriate agencies of the university at the time of printing (May 2007). Changes may be announced in official university publications subsequent to this printing and maintained online.

ACADEMIC DEGREES AND PROGRAMS

Undergraduate Degrees

College of Agriculture and Life Sciences
agricultural business management; agricultural and environmental technology; agricultural and extension education; agronomy; animal science; applied sociology; molecular and structural biochemistry; biological engineering; biological sciences; biomedical engineering; criminology; environmental sciences; food science; horticultural science; microbiology; natural resources; nutrition; plant biology; poultry science; turfgrass science; zoology; Preprofessional Programs - pre-dental, pre-medical, pre-optometry and pre-veterinary

College of Design
architecture (fifth year program); environmental design in architecture; art and design; graphic design; industrial design; landscape architecture

College of Education
general studies; business and marketing education; elementary education; mathematics education; middle grades education with concentrations in language arts and social studies or mathematics and science; science education; technology education

College of Engineering
aerospace engineering; biological engineering; biomedical engineering; chemical and biomolecular engineering; civil engineering; computer engineering; computer science; construction engineering and management; electrical engineering; engineering-mechatronics; environmental engineering; industrial engineering; industrial engineering furniture manufacturing; materials science and engineering; mechanical engineering; nuclear engineering; paper science and engineering; textile engineering

College of Humanities and Social Sciences
Africana studies; anthropology; arts applications; communication; criminology; English; English education option; French; French education option; history; interdisciplinary studies; international studies; philosophy; political science; psychology; religious studies; science, technology and society; social studies education options; social work; sociology; Spanish; Spanish education option; women's and gender studies

College of Management
accounting; business management; economics; management, innovation, entrepreneurship

College of Natural Resources
environmental science hydrology; environmental technology; fisheries and wildlife; forest management; natural resources; parks, recreation, and tourism management; professional golf management; paper science and engineering; sports management; wood products

College of Physical and Mathematical Sciences
chemistry; environmental sciences; geology; marine sciences; mathematics; meteorology; natural resources; physics; statistics

College of Textiles
polymer and color chemistry; textile engineering; fashion and textile management; textile technology

Pre-professional Programs

Pre-Law Services
Office of Advising Support, Information and Services
Law schools neither prescribe nor recommend a particular undergraduate curriculum for prospective candidates. A student may prepare for law school within any of the majors offered by the nine undergraduate colleges. The University Coordinator of Pre-Law Services, in conjunction with the student's academic adviser, assists any student with an interest in attending law school and provides information and planning strategies to prepare for this process. This can include: what needs to be considered in the academic record; the selection of appropriate electives and concentrations; law schools to consider; as well as, where to look for financial information. The Coordinator also works with the Pre-Law Student's Association (PLSA), which is open to all interested students. During the year the PLSA provides programs that have included: NC State Law School Fair, local attorneys, panel of Law School students, Law School Directors of Admission, information on the admissions process. At this time, the Pre-Law Advising Program is administratively housed in the Office of Advising Support, Information and Services within the Division of Undergraduate Academic Programs. For further information, contact the University Pre-law Coordinator Mary A. Tetro, 209 Ricks Hall, (919) 513-0912. You may also visit the website: www.ncsu.edu/project/prelaw.

Pre-Professional Healthcare Programs and Advising; Pre-Med, Pre-Dent, and Pre-Opt, Pre-Pharm, etc.
Many NC State undergraduate students are planning a career in the health professions and will apply to dental, medical, or optometry school prior to graduation. NC State provides a variety of services to help students explore the health professions as a possible career and to enhance a student's competitiveness for admission into a health professions school. These services include the CALS Health Professions Advising Center or Health PAC (see the information below and website link). The center assists with the healthcare career planning and advising, mentoring, letters of evaluation, internship and clinical opportunities, as well as numerous programs and resources to help students achieve their educational and career goals in human health care.

Health professional schools do not require students to obtain a designated "pre-health" degree. Instead, they seek students who have demonstrated academic success and who also have excelled in other areas including clinical and service experience as well as social development. Like most schools, NC State does not offer a dedicated "pre-health" curriculum. Instead we recommend that students interested in health professions select the academic major that is of greatest interest to them while ensuring that they select courses that provide a strong foundation in the natural sciences required by most professional programs for admission. These include biology, chemistry, physics, and calculus. It is also recommended that students select courses that improve communication and writing skills as well as provide strong foundations in the humanities.

For further information, contact Anita Flick, MD at health_pac@ncsu.edu or visit the Health PAC website at www.cals.ncsu.edu/health_pac.

The Health Professions Advising Center and the Health Professions Review Committee
In addition to a student's departmental academic adviser who will assist in selecting courses and program options, the College of Agriculture and Life Sciences also provides a Health Professions Advising Center to further assist students interested in health careers. Housed in 2719 and 2720 Bostian Hall and administered by the Biological Sciences Program, this center is dedicated to mentoring students throughout their college career, helping them to prepare their application for post-graduate studies. The Center assists pre-health students by answering questions and helping them explore health career options, locate and obtain clinical and service experience, and develop future career skills (such as technical writing, research review, etc.). The Center also helps students compile an Achievement Portfolio which provides an accounting of their academic, clinical, and service/community achievements for incorporation into their application to their selected health programs and for the subsequent interview process.

Once students are ready to submit applications for a medical, dental or optometry program, the Center is available to assist in this process as well. A NC State Health Professions Review Committee is available to students to review their applications and prepare a composite university committee recommendation, which is submitted to each of their selected schools. Many professional programs rely heavily on these university recommendations as component of their application screening process.

For more information on the Health Professions Advising Center and Review Committee, please contact Anita Flick, MD at health_pac@ncsu.edu or visit the website at www.cals.ncsu.edu/health_pac.

Pre-Veterinary Program
This area of study is a non-degree option offered by the College of Agriculture and Life Sciences. This option is available to students majoring in animal science, poultry science, zoology, or biological sciences as well as in many other science curricula, such as biochemistry or chemistry. If a student is accepted to veterinary medical school before completion of their undergraduate degree, some course credits may be transferable from the veterinary program toward completion of the Bachelor of Science degree. Arrangements for this procedure should be made with the degree granting school or department prior to entering veterinary college. For further information, contact the Academic Programs Office of the College of Agriculture and Life Sciences, (919) 515-2614, or the Admissions Office for Veterinary Students of the College of Veterinary Medicine, (919) 513-6205, for general information concerning admission to the Doctor of Veterinary Medicine program at NC State.

Undergraduate Minors

Some departments at NC State offer undergraduate minors for students wishing a systematic program of study in an area outside their major. All minors require at least 15 credit hours and may be either departmental or interdepartmental. Courses within the minor program may be used to satisfy any of the general requirements, including free electives, of a major curriculum. Minors are completely optional, the only requirement being that a student may not minor in the same discipline as their major. Students pursuing a minor must consult with a minor adviser on a plan of work and must file a copy of this plan with their major adviser at least one semester before graduation. Satisfactory completion of the minor will be noted on the final transcript following graduation. For an up-to-date listing of minors available at NC State, please see the following website: www.ncsu.edu/advising_central/minors.html.

Accounting
Africana Studies
Agricultural & Environmental Technology
Agricultural Business Management
Agroecology
American Literature
Animal Science
Anthropology
Apparel Technology
Applied Sociology
Architecture
Art and Design
Arts Studies
Biological Sciences
Biotechnology
Business Management
Chemical Engineering
Chinese Studies
Classical Greek
Classical Studies
Coaching Education
Cognitive Science
Computer Programming
Creative Writing
Criminology
Crop Science
Design Studies
Economics
English
Entomology
Entrepreneurship
Environmental Science
Environmental Toxicology
Extension Education
Feed Milling
Film Studies
Fitness Leadership
Food Science
Forest Management
French
Furniture Manufacturing
Genetics

continued on next page

Geology
German
Graphic Communications
Graphic Design
Health
Health, Medicine, & Human Values
Healthcare Product Management
Hindu-Urdu
History
Horticultural Science
Industrial Design
Industrial Engineering
International Studies
Italian Studies
Japanese
Japan Studies
Journalism
Landscape Architecture
Law and Justice
Linguistics
Materials Science and Engineering
Mathematics
Meteorology
Microbiology
Middle East Studies
Military Studies
Music
Nonprofit Studies
Nonwovens
Nutrition
Outdoor Leadership
Parks, Rec, &Tourism Management
Philosophy
Physics
Plant Biology
Political Science
Poultry Science
Psychology
Pulp and Paper Technology
Religious Studies
Russian Studies
Science, Technology, and Society
Social Work
Sociology
Soil Science
Spanish
Statistics
Technical & Scientific Communication
Technology Education
Textile Chemistry
Textile Technology
Theatre
Wetland Assessment
Women's and Gender Studies
Wood Products
World Literature
Zoology

Agricultural Institute

Admission to this two-year program requires the completion of a North Carolina State University Undergraduate Admissions application, a high school diploma or equivalent, a minimum high school grade point average of 2.0, and one letter of recommendation from a responsible citizen, not a relative, attesting to the prospective student's integrity and character. An Associate of Applied Science degree is awarded. Fields of study are:

Agribusiness Management
Agribusiness Management (Horticulture Concentration)
Field Crops Technology
General Agriculture
Livestock and Poultry Management
Ornamentals and Landscape Technology
Pest Management Technology (Agricultural and Urban Concentrations)
Turfgrass Management

Arts Studies

NC State offers a rich variety of courses in the history, analysis, and production of the arts - dance, film, music, theatre, and visual arts. Many of these courses are open to students without prerequisite, and are offered by 13 departments in four different colleges of the university.

In addition to these courses, most of which focus on a single art form, the Arts Studies Program offers courses which deal with several arts media or with the arts in connection with science and technology; these courses are listed in the back of this catalog and the schedule of courses each semester under the ARS prefix.

For students who want to concentrate in Arts Studies, a major in Arts Applications is available. It is administered by the Arts Studies Program in the College of Humanities and Social Sciences. In addition, there are minors in Arts Studies, Music, Theatre, Design and Film Studies.

Opportunities for students to participate in arts activities include many instrumental and choral organizations, student productions in University Theatre, craft instruction and facilities in the Craft Center, the NC State Computer Music Studio, and the exhibitions of the Visual Arts Program. For these activities, many of which are integrated with academic courses, see Student Activities in this section of the catalog.

The Arts Studies Program together with the Music Department sponsors the Arts Now Series. The Series includes performances of and lectures about contemporary performance works that include music. Guest performers, composers, dancers, and video artists appearing in the series range from regionally based artists to international guests from Europe and South America.

Graduate Degrees

Consult the *Graduate Catalog* at the NC State University Graduate School website www.fis.ncsu.edu/grad_catalog/catalog.htm or the Graduate School for information on graduate programs and admissions procedures: Graduate School, 1575 Varsity Drive, Flex Lab, Module 6, Box 7102, North Carolina State University, Raleigh, NC 27695-7102, (919) 515-2872.

ADMISSION

The "Early Action" freshman application deadline is November 1. "Early Action" applicants will receive a response by January 31 but still have until May 1 to confirm enrollment plans. The freshman application priority deadline for the fall semester and summer sessions is February 1; the transfer student priority deadline is April 1. Freshmen are strongly encouraged to apply during the fall of the senior year in high school. Applications for the spring semester should be submitted prior to November 1. All applicants for the College of Design must submit complete applications by December 1. The College of Design does not admit students in the spring. We highly recommend that prospective students apply online: admissions.ncsu.edu. A hardcopy application may be obtained by writing to:

Director of Undergraduate Admissions
Box 7103 North Carolina State University
Raleigh, North Carolina 27695-7103

Freshman Admission

Admission to the university is highly competitive, and it is possible to be admitted to some programs but not all programs at NC State. Applicants are asked to indicate their first and second choices for a curriculum, including undeclared majors within a college, or, if undecided, to indicate their choice of participating in the First Year College. Applicants not admitted in their first curriculum choice will be reviewed for admission in their second curriculum choice. Transfer between programs after a successful first year may be possible. The admissions decision is based on a holistic review of the complete application. Of primary importance is the high school record, including the level and difficulty of the courses taken, the overall grade point average, rank in class, and scores on the SAT or the ACT. Extracurricular involvement, leadership, and many other factors are also considered.

In addition, the Board of Governors of the University of North Carolina System has determined that the minimum undergraduate course requirements for all constituent institutions, including NC State, shall include a high school diploma or its equivalent and the following course units taken in high school:

1. Six course units in language, including
   - Four units in English
   - Two units in a language other than English
2. Four course units of mathematics in any of the following combinations:
   - Algebra I and II, Geometry, and one unit beyond Algebra II,
   - Algebra I and II, and two units beyond Algebra II or
   - Integrated Math I, II, III and one unit beyond Integrated Math III
3. Three course units in science, including
   - At least one unit in a life or biological science, and
   - At least one unit in physical science, and
   - At least one laboratory course
4. Two course units in social studies, including
   - One unit in U.S. history
   - One other unit in social studies

It is recommended that every student take a foreign language course and a mathematics course in the senior year. These are minimum course requirements. Competitive applicants will typically exceed these minimum courses.

An interview is not required and does not weigh in the admissions decision; a prospective student is always welcome to visit the Undergraduate Admissions Office. The Undergraduate Admissions Office conducts freshman information sessions Monday through Friday. Campus tours led by students are also available Monday through Friday. Prospective students should register for the information session and tour online; admissions.ncsu.edu.

Two-Year Agricultural Institute
Requirements for admission to the Agricultural Institute, a two-year terminal program, include graduation from high school with a 2.0 minimum grade point average or successful completion of the high school equivalency examination administered by the State Department of Public Instruction, and one letter of recommendation. SAT scores are not required. Course work is not transferable to the four-year degree programs. Completion of course work in the Agricultural Institute leads to an Associate of Applied Science (A.A.S.) degree. (See College of Agriculture and Life Science).

Standardized Test Scores
Applicants for admission as freshmen must submit scores from the SAT or the ACT Assessment. The ACT Assessment must include the Writing Test. Applicants are accepted on either junior or senior test scores, although senior scores are recommended. Applicants' scores must be sent directly from the testing service to NC State. (SAT Code #5496, ACT code #3164) Prospective students may find more information and applications for the tests online: www.collegeboard.com or www.act.org. Hardcopy application forms may be obtained from school counselors or by writing directly to the testing services:

SAT address:	The College Board ATP Box 592 Princeton, New Jersey 08541	ACT address:	ACT Registration P.O. Box 414 Iowa City, Iowa 52243-0451

SAT Subject Tests
Although not required for admission, freshman students must present SAT Mathematics Subject Test scores to ensure proper math placement at NC State. Students should take the Mathematics Level 2 test.

Advanced Placement (AP)/International Baccalaureate (IB)
A student may qualify for advanced placement by one or more of the following means: (1) by passing a proficiency examination administered by a teaching department at NC State; (2) by attaining a score of 700 or higher on the Critical Reading portion of the SAT; (3) by meeting a specific minimum score on certain of the Advance Placement Program (AP) or International Baccalaureate (IB) examinations; and (4) by attaining a minimum score on certain of the College Level Examination Program (CLEP) subject tests. For advanced placement policies, visit admissions.ncsu.edu/placemen.htm.

Out-of-State Students

Undergraduate applicants from outside North Carolina may be required to meet more competitive standards for admission than North Carolina residents. NC State is limited to enrolling not more than 18 percent of total new undergraduate students from outside the state.

Transfer Students

NC State welcomes transfer applicants, and in recent years, more than 25 percent of our graduates started their college programs at other institutions. A transfer student should present at least 30 semester hours (or 45 quarter hours) of "C" or better college level work, including an English class and a college level math class applicable to the degree program. Additional specific course work is required for most programs. Transfer admission is highly competitive, and the grade point average required for consideration varies depending on the requested program of study. Transfer students must be eligible to return to the last institution previously attended and must submit individual transcripts from each institution.

Students who graduated from high school since 1990 must submit a high school record to verify that they have met minimum admissions requirements for course work as outlined in the Freshman Admissions section of this catalog. Exceptions to this requirement are students who will have earned an A.A., A.S., or A.F.A. degree before enrolling at NC State. Individuals who do not have the minimum admissions requirements at the high school level must complete at the college level six semester hours or nine quarter hours each of English, foreign language, mathematics, science, and social science to be eligible to transfer.

Previous college transcripts are evaluated for credit that is transferable to the university as part of the admission application review. A grade of "C" or better is required before a course may be considered for credit. The college to which the application is made will determine the exact amount of credit applicable toward a degree at NC State.

International Students

NC State welcomes international student applications, and has a long history of enrolling outstanding international students. Applicants who are not citizens of the U.S. must apply online: admissions.ncsu.edu. International applicants are carefully screened for evidence of English language proficiency, adequate financial resources and academic credentials indicating a high potential for success.

TOEFL
Applicants whose native language is other than English must submit TOEFL (Test of English as a Foreign Language) scores as evidence of their ability to use English at a level of competence necessary for university course work. A minimum score of 79 is required on the internet based TOEFL exam (213 is required for the computer-based TOEFL exam.) Some departments may have higher score requirements. (See www.ets.org for information on test dates and localities.)

Financial and Immigration Information
All accepted applicants will receive a letter of provisional acceptance and a Certificate of Financial Responsibility (CFR). In addition, accepted applicants who are already in the U.S. will also receive a Visa Clearance Form (VCF). Those applicants seeking an F-1 or J-1 student visa must complete the Certificate of Financial Responsibility. The purpose of this form is to certify financial solvency for the student throughout his/her program of study - this is a federal requirement that must be met before we can issue any visa certificates. For more information on the CFR, please see the CFR Instruction Page in the Office of International Services (OIS) website www.ncsu.edu/oisss/admissions/cfrinstructions.html. Applicants who receive the VCF must provide proof of their current nonimmigrant status. This includes those individuals who are Permanent Residents of the U.S. (Once OIS receives proof of the permanent residency, Permanent Residents will no longer be considered international students.) Applicants who are already in the United States in a nonimmigrant visa category other than F-1 or J-1 (ex: Permanent Residents, H-4, F-2, J-2, E-2, etc.) are not required to complete and return the CFR, unless they plan to change to F-1 or J-1 student status (if eligible). Applicants currently in the U.S. in another nonimmigrant status who wish to change to F-1 or J-1 status will need to consult with an OIS adviser to discuss change of status options. Please do not send financial statements or immigration documents to the Admissions Office or OIS before they are requested. Please consult the Admissions website or the OIS website for the published deadlines by which all CFR and VCF forms must be submitted to OIS. International applicants who cannot submit the CFR and VCF by the deadline or who are not able to obtain a visa and enter before the academic term begins may have to defer to a later term.

OIS will review the CFR and, if appropriate, the VCF, upon receipt. If the information provided by the applicant is incomplete or not duly supported by proper documentation (e.g. sponsor and bank official signatures, bank statements, etc.), the applicant will be notified that his/her documents were not approved and why. Initial notification is done via
e-mail, then regular airmail if necessary. The applicant will then have an opportunity to correct the problem(s) and resubmit the

form(s). Once OIS approves the financial documents, and if necessary, visa clearance form, OIS will notify the appropriate admissions office that the applicant has been cleared for official full acceptance. Applicants can check the status of their applications directly with the Admissions Office. OIS will prepare the appropriate Certificate of Eligibility (Form I-20 for an F-1 visa or Form DS-2019 for a J-1 visa) and mail it to the applicant, along with the full Admission Letter, and other important pre-arrival information. The applicant at this point is considered fully admitted to the university. New international students must check-in with OIS upon arrival to campus and attend the New International Student Orientation, which is scheduled a few days before the semester begins.

For more information regarding the issuance of visa certificates or obtaining a visa, changing nonimmigrant status, transfer for international students, SEVIS, etc., please contact OIS, e-mail: oisss@ncsu.edu; phone: (919) 515-2961; website: www.ncsu.edu/oisss/admissions/index.htm; 320 Daniels Hall, 101 Lampe Drive, Campus Box 7222, Raleigh, NC 27695-7222.

Unclassified Students

Unclassified students are those working for credit within a college but not enrolled in a degree-granting program. Admission as an unclassified student requires the recommendation of the dean of the school in which the student wishes to enroll. Unclassified students must meet the same entrance requirements as regular degree students and must meet the same academic requirement to continue. If, at a later date, unclassified students wish to change to regular status, their credits will be evaluated in terms of the requirements of their intended curriculum.

Lifelong Education Students (Non-Degree Students)

The Lifelong Education student classification is designed for individuals who have not been formally admitted into a degree program at the university but who wish to enroll in courses offered by the university. Lifelong Education students are limited to a maximum course load of two courses plus one physical education course each semester or summer session.

Lifelong Education student applications should be made online at www.ncsu.edu/cpss. If Lifelong Education students wish to become undergraduate degree candidates at a later date, they must make application through the Office of Undergraduate Admissions and are encouraged to make an appointment with that office to discuss entrance requirements. These students may use undergraduate courses to fulfill transfer admission requirements. Lifelong Education students wishing to become graduate degree candidates must make application through the Graduate School and should consult the Director of Graduate Programs in the chosen field of study for advice or clarification of information.

College Level Examination Program (CLEP)

The College-Level Examination Program® or CLEP is a national credit-by-examination program administered by The College Board. CLEP exams provide students with the opportunity to demonstrate college-level achievement through a program of proficiency exams in undergraduate college courses. By proving satisfactory knowledge of a particular area of study, credit for corresponding college courses can be granted.

There are approximately 1,400 CLEP test centers across the United States. You should select the test center most convenient for you and contact that center directly for information regarding registration, fees, test dates, parking, etc. For detailed information about CLEP, available exams and test center locations contact the College Board at:

The College Board
P.O. Box 6600
Princeton, NJ 08541-6600

phone: 800-257-9558
fax: (609) 771-7088
website: www.collegeboard.com/student/testing/clep/about.html

For information about the exams and required scores accepted by NC State and the corresponding NC State course credit granted, please refer to the following website: admissions.ncsu.edu/placemen.htm.

Graduate Students

Regulations governing graduate admission are outlined in the *Graduate Administrative Handbook*. To view the Graduate Administrative Handbook, go to the NC State University Graduate School website at www.fis.ncsu.edu/grad_publcns/handbook/

Required Immunization Documentation

Verified proof of immunization against rubella, measles, tetanus, and diphtheria must be presented to Student Health Services by May 30 for fall semester or within 30 days of acceptance. Meningococcal vaccine is recommended, especially for freshmen living in residence halls, and for others wishing to lessen their risk of meningococcal meningitis. A PPD skin test within 12 months of the first day of class is required for international students. Please note that under North Carolina regulations, a student must be dropped from his or her classes if immunization requirements are not met and a $150 charge levied for re-enrollment. For assistance, contact Student Health Services, (919) 515-7233.

TUITION AND FEES

Note: Since tuition and fees for the 2007-2008 school year were not approved by the publication date, the rate schedules listed below represent estimated rates. These rates are subject to change. For the most current information available, please see the following website: www.fis.ncsu.edu/cashier/tuition.

North Carolina Resident - $2,558.50 per semester (effective 2007-2008 academic year)

Nonresident - $8,657.50 per semester (effective 2007-2008 academic year)

A statement of tuition and fees is posted on each student's account that registered during a normal registration period. Students are notified via e-mail (eBill) when a new statement has posted. The statement must be returned with full payment or approved financial aid information by the due date appearing on the statement. The due date is approximately two weeks before classes begin. Students registering during a late registration period will be required to pay their tuition and fees at the time of registration and may be subject to a late registration fee. Fees are the same for both residents and nonresidents and are required of all students. Nonresident students are required to pay an additional $6,099 per semester for tuition.

Estimated Annual Undergraduate Expenses

Tuition and Fees	First Semester	Second Semester	Full Year
NC Residents	$2,557.50	$2,557.50	$5,117.00
Out of State Residents	8,657.50	8,657.50	17,315.00
Room Rent	2,144.00	2,144.00	4,288.00
Meals	1,376.00	1,376.00	2,752.00
Books and Supplies	465.00	465.00	930.00
Personal Expenses	615.00	615.00	1,230.00
Transportation - in state	275.00	275.00	550.00
Transportation - off campus/out of state	525.00	525.00	1,050.00
Total Tuition and Fees			
NC Residents	$7,598.50	$7,598.50	$15,197.00
Out of State Residents	$13,947.50	$13,947.50	$27,895.00

NOTE:

1. Tuition and fees are fixed items of cost
2. Room rent is shown as main-campus, double occupancy rate
3. Meals, books and supplies, other personal expense, and transportation are shown as estimates

Expenses Other than Tuition and General Fees

Application Fee: A nonrefundable fee ($70 U.S. citizens and permanent residents, $80 for international applicants) must accompany each application for admission.

Room Rent: New incoming students receive instructions on how to apply for housing with the letter of acceptance. Continuing students receive room reservation information each January at their residence hall rooms. The 2007-2008 residence hall room rent ranges from $2,075.00 to $2,315.00 per semester and plus a mandatory $90.00 ResNet (internet) charge. The Wolf Village Apartments charge $2395.00 per semester plus mandatory charges for ResNet ($90.00) and cable television ($48.13) for the living room per semester.

Meals: During their first academic year, new freshmen electing to reside on campus are required to participate in one of the university's available meal plans. Meal plans are available to all registered students and costs for 2007-2008 range from $730.00 to 1,030.00. Students may also pay for meals individually at the various dining facilities available both on and near campus.

Books and Supplies: Books and supplies are usually purchased during the first week of classes directly from the NCSU Bookstores. Allow approximately $465 per semester for purchasing books and supplies.

Personal Expenses: Personal expenses vary widely among students but the estimate of $615 is based on what students report that they spend on these items.

Administrative Management Fee: A special administrative management fee of $250 per semester and $150 per summer session is required from a contracting agency sponsoring international students whose programs are coordinated through the university's Office of International Visitors.

Cooperative Education Program Fee: Required of all participating co-op students for each semester in which they are enrolled in an off campus work assignment. This fee, set at $338 for the 2007 Fall Semester, the 2008 Spring Semester, or the combined 2008 Summer Sessions, is used for partial support of the Cooperative Education Program staff in job development and placement activities. Students paying this fee are entitled to all university services, facilities, and programs during the semester or combined summer sessions for which they are enrolled.

College of Engineering Computing Fee: All students enrolled in the College of Engineering, both graduate and undergraduate, will be billed a $45 per semester fee to support the Engineering Computing Facility. Payment of the fee will provide students with access to standalone workstations that comprise the Engineering Computing Facility. Engineering students who enroll in a co-op work session will not be billed for the computing fee unless they also enroll in an NC State course.

Professional Golf Management Fee: Students enrolled in the Professional Golf Management program (PGM) will be charged $200/ semester. The fee pays for golf play and practice privileges at several area golf courses.

Required Fees

Required fees are levied for services, facilities, and programs available to all students whether or not the student takes advantage of them. Students are assessed fees based on the course load they are taking. An itemization of required fees and other detailed information concerning expenses or related data can be obtained by contacting the University Cashier's Office, NC State, Box 7213, Raleigh, North Carolina 27695-7213, (919) 515-2986 or via email at studentaccounts@ncsu.edu or at the following website: www.fis.ncsu.edu/cashier/tuition.

Refund Policy

Reduction in Hours: The last day to reduce hours and receive a refund or reduction in rates is the same as the last day to register or add hours, typically the 10th day of a fall or spring term and the 3rd day of a summer session. Tuition and Fees are not prorated after this date for reduced course loads. Specific dates are posted on the Cashier's website and in Pack Tracks.

Withdrawal: Dropping all courses for which you are registered constitutes a Withdrawal from the University. Refunds for official withdrawals from NC State University are prorated based upon the percentage of the enrollment period attended. No refunds are made for official withdrawals after 50 percent of the enrollment period has passed. The prorated withdrawal schedule for each semester is publicized on the Cashier's website and through university media after it is established. In some instances, circumstances justify the waiving of rules regarding refunds. An example might be withdrawal for medical reasons. Students have the privilege of appeal to the Fee Appeals Committee when they believe special consideration is merited. Applications for such appeals may be obtained online at www.fis.ncsu.edu/cashier or from the University Cashier's Office, 2005 Harris Hall.

Residence Status for Tuition Purposes

The basis for determining the appropriate tuition charge rests upon whether a student is a resident or a nonresident for tuition purposes. Each student must make a statement as to the length of his or her residence in North Carolina, with assessment by the institution of that statement to be conditioned by the following.

Residence. To qualify as a resident for tuition purposes, a person must become a legal resident and remain a legal resident for at least twelve consecutive months immediately prior to classification. Thus, there is a distinction between legal residence and residence for tuition purposes. Furthermore, twelve months legal residence means more than simple abode in North Carolina. In particular, it means maintaining a domicile (permanent home of indefinite duration) as opposed to "maintaining a mere temporary residence or abode incident to enrollment in an institution of higher education." The burden of establishing facts which justify classification of a student as a resident entitled to in-state tuition rates is on the applicant for such classification, who must show his or her entitlement by the preponderance (the greater part) of the residentiary information.

Initiative. Being classified a resident for tuition purposes is contingent on the students seeking such status and providing all information that the institution may require in making the determination.

Parents' Domicile. If an individual, irrespective of age, has living parent(s) or court appointed guardian of the person, the domicile of such parent(s) or guardian is, prima facie, the domicile of the individual; but this prima facie evidence of the individual's domicile may or may not be sustained by other information. Further, non-domiciliary status of parents is not deemed prima facie evidence of the applicant child's status if the applicant has lived (though not necessarily legally resided) in North Carolina for the five years preceding enrollment or registration.

Effect of Marriage. Marriage alone does not prevent a person from becoming or continuing to be a resident for tuition purposes, nor does marriage in any circumstance insure that a person will become or continue to be a resident for tuition purposes. Marriage and the legal residence of one's spouse are, however, relevant information in determining residentiary intent. Furthermore, if both a husband and his wife are legal residents of North Carolina and if one of them has been a legal resident longer than the other, then the longer duration may be claimed by either spouse in meeting the twelve month requirement for instate tuition status.

Military Personnel. Any active duty member of the armed services qualifying for admission to an institution of higher education but not qualifying as a resident for tuition purposes shall be charged the in-State tuition rate and applicable mandatory fees for enrollments while the member of the armed services is abiding in this State incident to active military duty in this State. In the event the active duty member of the armed services is reassigned outside of North Carolina or retires, the member shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the member is continuously enrolled in the degree or

other program in which the member was enrolled at the time the member is reassigned. In the event the active duty member of the armed services receives an Honorable Discharge from military service, the member shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the member establishes residency in North Carolina within 30 days after the discharge and is continuously enrolled in the degree of other program in which the member was enrolled at the time the member is discharged.

Any dependent relative of a member of the armed services who is abiding in this State incident to active military duty, as defined by the Board of Governors of The University of North Carolina and by the State Board of Community Colleges while sharing the abode of that member shall be eligible to be charged the in-State tuition rate, if the dependent relative qualifies for admission to an institution of higher education. The dependent relatives shall comply with the requirements of the Selective Service System, if applicable, in order to be accorded this benefit. In the event the member of the armed services is reassigned outside of North Carolina or retires, the dependent relative shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the dependent relative is continuously enrolled in the degree or other program in which the dependent relative was enrolled at the time the member is reassigned or retires. In the event the member of the armed services receives an Honorable Discharge from military service, the dependent relative shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the dependent relative establishes residency within North Carolina within 30 days after the discharge and is continuously enrolled in the degree or other program in which the dependent relative was enrolled at the time the member is discharged.

A person charged less than out-of-state tuition rate solely by reason of this section shall not, during the period of receiving that benefit, qualify for or be the basis of conferring the benefit of G.S. 116-143.1.

Grace Period. If a person (1) has been a bona fide legal resident, (2) has consequently been classified a resident for tuition purposes, and (3) has subsequently lost North Carolina legal residence while enrolled at a public institution of higher education, that person may continue to enjoy the in-state tuition rate for a grace period of twelve months measured from the date on which North Carolina legal residence was lost. If the twelve months ends during an academic term for which the person is enrolled at a State institution of higher education, the grace period extends, in addition, to the end of that term. The fact of marriage to one who continues domicile outside North Carolina does not by itself cause loss of legal residence marking the beginning of the grace period.

Minors. Minors (persons under 18 years of age) usually have the domicile of their parents, but certain special cases are recognized by the residence classification statute in determining residence for tuition purposes.

a) If a minor's parents live apart, the minor's domicile is deemed to be North Carolina for the time period(s) that either parent, as a North Carolina legal resident, may claim and does claim the minor as a tax dependent, even if other law or judicial act assigns the minor's domicile outside North Carolina. A minor thus deemed to be a legal resident will not, upon achieving majority before enrolling at an institution of higher education, lose North Carolina legal residence if that person (1) upon becoming an adult "acts, to the extent that the person's degree of actual emancipation permits, in a manner consistent with bona fide legal residence in North Carolina" and (2) "begins enrollment at an institution of higher education not later than the fall academic term following completion of education prerequisite to admission at such institution."
b) If a minor has lived for five or more consecutive years with relatives (other than parents) who are domiciled in North Carolina and if the relatives have functioned during this time as if they were personal guardians, the minor will be deemed a resident for tuition purposes for an enrolled term commencing immediately after at least five years in which these circumstances have existed. If under this consideration a minor is deemed to be a resident for tuition purposes immediately prior to his or her eighteenth birthday, that person on achieving majority will be deemed a legal resident of North Carolina of at least twelve months duration. This provision acts to confer in-state tuition status even in the face of other provisions of law to the contrary; however, a person deemed a resident of twelve months duration pursuant to this provision continues to be a legal resident of the State so long as he or she does not abandon North Carolina domicile.

Lost but Regained Domicile. If a student ceases enrollment at or graduates from an institution of higher education while classified as a resident for tuition purposes and then both abandons and re-acquires North Carolina domicile within a twelve month period, that person, if he or she continues to maintain the reacquired domicile into re-enrollment at an institution of higher education, may re-enroll at the instate tuition rate without having to meet the usual 12-month durational requirement. However, any one person may receive the benefit of this provision only once.

Change of Status. A student admitted to initial enrollment in an institution (or permitted to enroll following an absence from the institutional program which involved a formal withdrawal from enrollment) must be classified by the admitting institution either as a resident or as a nonresident for tuition purposes prior to actual enrollment. A residence status classification once assigned (and finalized pursuant to any appeal properly taken) may be changed thereafter (with corresponding change in billing rates) only at intervals corresponding with the established primary divisions of the academic year.

Transfer Students. When a student transfers from one North Carolina public institution of higher education to another, he or she is treated as a new student by the institution to which he or she is transferring and must be assigned an initial residence status classification for tuition purposes.

Tuition of certain teachers. Any teacher or other personnel paid on the teacher salary schedule who (1) has established legal residence (domicile) in North Carolina and (2) is employed full-time by a North Carolina public school, shall be eligible to be charged the in-state tuition rate for courses relevant to teacher certification or to professional development as a teacher.

UNC System Employees. A person who is a full-time employee, in a permanent position, of The University of North Carolina, or is the spouse or dependent child of a full-time employee, in a permanent position, of The University of North Carolina, and **who is a**

legal resident of North Carolina, qualifies as a resident for tuition purposes without having maintained that legal residence for at least 12 months immediately prior to his or her classification as a resident for tuition purposes.

Note: General Statue (G.S.) 116143.1 is the prevailing statute governing residence status classification. Copies of the applicable law and of the implementing regulations are available for inspection in the Office of Undergraduate Admissions, 203 Peele Hall. This information is subject to change.

FINANCIAL AID

To be considered for financial assistance by the Office of Scholarships and Financial Aid, a student and his or her parents must complete the federal government's Free Application for Federal Student Aid (FAFSA). The FAFSA is available from high school guidance offices as well as the NC State Office of Scholarships and Financial Aid, or may be completed via the web at www.fafsa.ed.gov. This form must be submitted to the federal student aid processing center for evaluation of the family's ability to pay for educational expenses. Students who submit FAFSAs to the federal processor by March 1 for the upcoming academic year are considered on-time applicants and are given first priority for need-based scholarship and grant consideration.

By completing the FAFSA, undergraduates are given consideration for all forms of federal financial assistance, including the Federal Pell Grant, as well as most types of state and institutional financial aid (except for departmental and university academic awards, which may require separate applications). Most financial aid awards are made based on the applicant's financial need, satisfactory academic progress, and timely submission of the FAFSA. Determination of the applicant's need is based on estimated educational costs as established by the Office of Scholarships and Financial Aid and a consideration of the family's financial strength, as determined by the analysis of the FAFSA.

Aid is available on a non-discriminatory basis to all qualifying students. Financial aid awards are usually made in the form of "packages" which consist of a combination of gift aid (scholarships and grants), loans, and/or campus employment through the Federal Work-Study program. These aid packages include aid from all sources, including the federal government, state and institutional funds, and private entities. Students must reapply for aid each year, and renewal is based on continued financial need as well as satisfactory academic progress as defined by the Policy on Satisfactory Academic Progress for Financial Aid Eligibility - ncsu.edu/finaid/pdf/satprorv.pdf

A brochure giving a detailed explanation of the aid application and financial aid award process, as well as types of aid available, may be obtained from the Office of Scholarships and Financial Aid, 2016 Harris Hall, (919) 515-2421. Also, financial aid information is available via the web at ncsu.edu/finaid.

Other Types of Scholarships and Financial Aid Services

Short-term Loans. Short-term loans are available in small amounts (usually not exceeding $100) to full time students with previous good payment records. These loans are generally approved one day and distributed the following day, and are intended to provide financial assistance to meet unexpected expenses. Short-term loans must be repaid within 30 days or by the end of the term, whichever comes first.

Student Employment Service. The Office of Scholarships and Financial Aid coordinates an employment service to assist students with information about part-time academic year or summer employment possibilities. No particular academic or financial qualifications are required to obtain jobs on or off campus. (Note: Federal Work-Study jobs are need-based and are not included in this listing). A current listing of job openings is maintained by the Office of Scholarships and Financial Aid and under student employment at ncsu.edu/finaid.

SCHOLARSHIPS

University Academic Scholarships for Entering Freshmen

Park Scholarships. *"America's greatest resource is the youth of the land. An investment in the development of the talents and capabilities of highly motivated young men and women is an expression of faith in the future of the State and Nation; it is also a public service of untold value, through the provision of successive generations of first-rate scientists, scholars, and leaders to serve the State and Nation."* - excerpt from proposal to establish the Park Scholarships

The Park Scholarships were established in 1996 at NC State University with the splendid vision and significant financial commitment of the Park Foundation of Ithaca, New York. The Scholarships celebrate the life of Roy H. Park, one of the University's most distinguished alumni, and provide the full cost of education and related expenses, enrichment activities, and a stipend for a personal computer. The scholarship is awarded to entering freshmen from all over the country for undergraduate studies in any discipline at NC State. The first class of scholars began in the fall of 1996 with 25 freshmen. There are now about 200 Park Scholars on campus each year. The Park Scholarships has become one of the most prestigious undergraduate scholarships in the United States, with just over $46 million committed to date by the Park Foundation.

Park Scholars are selected on the basis of merit, exemplary character, exceptional potential for leadership and the sense of promise that they may one day make contributions of enduring importance to the betterment of the human condition. The goal of the selection

process is to identify young people with demonstrated high achievement and leadership as well as those with unusual aptitudes, uncommon talents, and special gifts of creativity or entrepreneurial acumen.

Currently about 50 Park Scholarships are awarded per year, totaling about $3.5 million. Two-thirds of the scholarships (35) are awarded to North Carolina residents and one-third (15) to residents of other states. The awards are renewable contingent on high standards for the Scholars' academic achievement, commitment to the program ideals and personal conduct. Candidates must be U.S. citizens to be eligible for the Park Scholarships; permanent residents are ineligible. The Park Scholarships application is delivered online. For more information on how to apply, visit www.ncsu.edu/park_scholarships.

Caldwell Fellow Scholarships. Caldwell Fellow Scholarships are the oldest merit-based scholarship program at NC State and the only university-wide academic award for first year students at NC State. The scholarship fills the unique niche of identifying and developing talented students with a proven record of academic success and service at NC State. A select group of twenty-five new Fellows receive a financial award that includes three years of an annual tuition stipend, as well as self-development stipends for experiences in study abroad, professional development, leadership development and service. The scholarship value is in excess of $20,000 over three years.

The application period for selection begins in January of each year, after a student's initial semester at NC State is complete. The program actively seeks applicants from all colleges at NC State. The rigorous selection process begins with a student's academic eligibility (a minimum 3.25 NC State gpa) and completion of application materials, available at the website: www.ncsu.edu/caldwell. Folder reviews by campus faculty and program alumni determine the semi-finalists who are invited to interviews in mid-February.

The Caldwell Fellows Scholarship Program was created to honor the legacy of John T. Caldwell and to carry out his spirit and ideals. As Chancellor of NC State for 16 years, he presided over the university as a servant leader: inspiring excellence, modeling moral behavior and marshaling the strengths of the entire campus to further the common good. Guided by a deep respect for the potential inside every individual, he held a vision of NC State as a place where young people could find and refine their unique capabilities and potential. The Caldwell endowment is the university-wide merit-based scholarship funded by alumni and supporters of NC State. The endowment is held by the NC State Alumni Association.

The Caldwell Fellows are also part of the NC Fellows Program, originally known as the Richardson Fellows Program, established in 1968 by Smith Richardson of the Richardson Vicks Corporation. Concerned for the state's future leadership, Mr. Richardson established Fellows Programs on North Carolina campuses and charged them with developing leadership in their promising students. Caldwell Fellows and UNC-CH Fellows maintain close ties and are affiliated with the internationally acclaimed Center for Creative Leadership, also created by the Smith Richardson Foundation.

The Caldwell Fellow Scholarship Program has a rich thirty-five year history with over 950 distinguished alumni.

University Wide Academic Scholarships. NC State offers competitive scholarships for entering freshmen in an effort to recognize and encourage exceptional academic ability and talent. Selection is merit-based and not restricted by major. For more information on how to be considered, visit ncsu.edu/finaid/scholarshipresources.htm.

University Need-Based Academic Scholarships. NC State offers scholarships to students who are deemed academically competitive, exhibit special talents or characteristics, and demonstrate financial need. Selection criteria may be specific to county of residence or major. To be considered, all students must apply for financial aid by submitting the Free Application for Federal Student Aid (FAFSA) by March 1. For additional application information, please visit ncsu.edu/finaid/scholarshipresources.htm.

Chancellor's Leadership Scholarship. Entering freshmen who have financial need and demonstrated leadership experience or potential are encouraged to apply for this award. Applications may be requested from the NC State Office of Scholarships and Financial Aid.

College Based Scholarships. Scholarships, funded by alumni, friends of the university, college foundations and industry are available to entering freshmen as well as continuing students. Scholarship amounts and criteria vary. Scholarship committees within each college are responsible for scholarship decisions. Consult the Dean's Office or specific college or department website to determine if a separate application is required.

Outside/Private Scholarships. NC State encourages students to search for scholarships offered by agencies not affiliated with the university. Many organizations offer awards based on place of residence, background, professional affiliations and/or field of study. Students should search and apply for outside scholarships independently. There are many free online scholarships search sites. In addition, book listings are available in bookstores and libraries. Visit ncsu.edu/finaid/scholarshipresources.htm for additional information and recommended search sites.

University Academic Scholarships for Continuing Students

University Need-Based Academic Scholarships. NC State offers scholarships to students who are deemed academically competitive, exhibit special talents or characteristics, and demonstrate financial need. Selection criteria may be specific to county of residence or major. All students who apply for financial aid by submitting the Free Application for Federal Student Aid (FAFSA) by March 1 will automatically be considered for these scholarships. For additional application information, please visit ncsu.edu/finaid/scholarshipresources.htm

College Based Scholarships. Scholarships, funded by alumni, friends of the university, college foundations and industry are available to entering freshmen as well as continuing students. Scholarship amounts and criteria vary. Scholarship committees within each college are responsible for scholarship decisions. Consult the Dean's Office or specific college or department website to determine if a separate application is required.

Outside/Private Scholarships. NC State encourages students to search for scholarships offered by agencies not affiliated with the university. Many organizations offer awards based on place of residence, background, professional affiliations and/or field of study. Students should search and apply for outside scholarships independently. There are many free online scholarships search sites. In addition, book listings are available in bookstores and libraries. Visit ncsu.edu/finaid/scholarshipresources.htm for additional information and recommended sites.

REGISTRATION

Registration is conducted using Pack Tracks, Registration and Records' online student services application. Pack Tracks is available from the Registration and Records' website www.ncsu.edu/registrar. This website contains all the necessary instructions for completing registration. A Schedule of Courses for each semester is also available online prior to the beginning of the registration period.

Registration consists of three steps: (1) meeting with advisers to determine course requirements and to obtain a Personal Identification Number (PIN); (2) registering for courses using the Pack Tracks system; and (3) paying tuition, fees, and all other debts to the university by the established deadlines. Advising and registration dates and deadlines are published on the web each semester.

For more information, contact:

Department of Registration and Records
1000 Harris Hall
Box 7313, NC State University
Raleigh, NC 27695

phone: (919) 515-2572
fax: (919) 515-2376
e-mail: rr_comments@ncsu.edu
website: www.ncsu.edu/registrar

Cooperative Registration Programs

Two registration programs were developed for the purpose of fostering cooperative educational activities. Under these programs students have the opportunity to register for courses at other institutions and to participate in cooperative library arrangements and joint student activities. For more information, visit www.ncsu.edu/registrar/cooperative.

Inter-institutional Registration Program
The Inter-Institutional Registration Program is a voluntary organization comprised of NC State, Duke, North Carolina Central University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, and University of North Carolina at Greensboro for the purpose of developing and conducting cooperative educational activities. The program provides the opportunity for students to enroll at another institution for a course accepted for their program of study and not offered on their home campus. Other activities include a cooperative library arrangement, joint student activities, and faculty cooperation and interchange. Interested students should contact the Inter-institutional Coordinator at (919) 515-2572 or visit www.ncsu.edu/registrar/cooperative.

Cooperating Raleigh Colleges
The Cooperating Raleigh Colleges Program (CRC) is a voluntary organization comprised of NC State, Meredith College, Peace College, St. Augustine's College, and Shaw University for the purpose of developing and conducting cooperative educational activities within the Raleigh area. The course taken at the visited school must be a course that is required but not offered through NC State. Men may not register for courses at Peace College. Interested students should contact the Inter-institutional Coordinator at (919) 515-2572 or visit www.ncsu.edu/registrar/cooperative.

Veterans Affairs

NC State University is approved to administer veterans benefits to eligible students. The Veterans Affairs Office is located in Registration and Records, 1000 Harris Hall. Students who are eligible to receive veterans benefits should contact the NC State Certifying Official at (919) 515-3048 or veterans_affairs@ncsu.edu. For more information see the VA website at www.ncsu.edu/registrar/va.

Schedule Revision (drops and adds)

Note: NC State University policies, rules and regulations are updated and reviewed as the need arises. For the most current information regarding this section, please visit the following website: www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.3.php.

Courses may be added during the first week of a regular semester without permission of the instructor and during the second week with the permission of the instructor. For specific deadlines, visit www.ncsu.edu/registrar/calendars.

Courses may be dropped without regard to course load during the first two weeks of a regular semester. During weeks three through six of a semester, full-time undergraduate students who wish to drop courses at any level and whose academic load would thereby fall below the twelve hour minimum course load may do so only for documented medical reasons or other verified, unforeseen grounds of personal or family hardship.

Exceptions to the drop policies require the recommendation of a student's adviser, the departmental coordinator of advising or the departmental head, and approval by the student's dean.

Students who wish to drop all courses for which they are enrolled, must withdraw from the university for the remainder of the semester or summer session in which they are enrolled. A degree student who finds it necessary to drop all courses will initiate withdrawal from the university at the Counseling Center, Student Health Center, 2815 Cates Avenue, second floor.

UNIVERSITY HOUSING

Eligibility

To be eligible to live in University Housing during the fall and spring semesters, undergraduate students must be enrolled in at least nine credit hours. Students, who must drop below these minimum requirements during the semester, should contact University Housing to request an exception. During the summer sessions, housing is provided for any enrolled student as space permits.

For more information about campus housing, contact University Housing online at www.ncsu.edu/housing, visit 1112 Pullen Hall, or call (919) 515-2440.

Residence Halls

University Housing operates twenty residence halls across campus for almost 7,000 students. A variety of residential options are available to accommodate diverse student interests and needs. Each hall is different, with amenities such as computer labs, laundry rooms, kitchens, and multi-purpose rooms. Specific information along with virtual tours of each hall can be found on the University Housing website at www.ncsu.edu/housing.

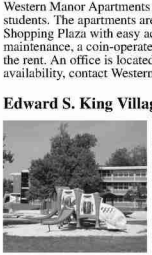
Wolf Village Apartments

Wolf Village is an exciting on-campus apartment community for 1,200 NC State juniors, seniors and graduate students. Each fully furnished four-bedroom apartment contains two full bathrooms, four single bedrooms with double beds, living room, kitchen, washer/dryer, and cable TV in the living room and high-speed Internet access in each room. Wolf Village features a fitness room, computer lab, convenience store, volleyball courts, and Wolfline bus stops. For additional information please visit www.ncsu.edu/housing/apartments or call (919) 513-9653.

Western Manor Apartments

Western Manor Apartments provides 118 apartments (studio, one-bedroom, and two-bedroom units) for juniors, seniors and graduate students. The apartments are located at 2300 Avent Ferry Road near NC State's Centennial Campus and the Mission Valley Shopping Plaza with easy access to the Wolfline and CAT bus lines. All apartments have electric heat, 24-hour emergency maintenance, a coin-operated laundry on the premises and are unfurnished. Water, sewage, and trash removal are provided as part of the rent. An office is located on-site for convenience and easy response to any issue. For more information about apartment availability, contact Western Manor Apartments at (919) 513-0599 or visit the website www.ncsu.edu/housing/apartments.

Edward S. King Village (ES King Village)



ES King Village is a community of 295 apartments (studio, one-bedroom, and two-bedroom units) that serves NC State's married, graduate, and non-traditional undergraduate students. With a diverse multicultural environment, residents are given the opportunity to experience the world in their own backyard. At ES King Village, community and convenience combine in an environment that nurtures academic success and provides for the needs of both students and families.

The apartments provide easy access to the Wolfline (campus bus) and city bus stop, are within walking distance of grocery stores, restaurants, and are zoned to a quality elementary school. The office is located in the ES King Village Commons which also contains a multi-purpose room, kitchen, TV lounge, and game room.

The staff and the Village Council implement programs and activities for students, spouses, and children. For more information about apartment availability, contact ES King Village at (919) 515-2430 or visit the website www.ncsu.edu/housing/eskingvillage.

Off-Campus Housing

University Housing maintains self-help listings of off-campus apartments, rooms, and houses for rent. These listings are available in the University Housing Office, 1112 Pullen Hall, during the hours of 8:00 a.m. - 5:00 p.m., Monday through Friday.

Living and Learning Villages

University Housing believes that learning doesn't take place solely in the classroom, and that we have a responsibility to enhance and facilitate our students' educational opportunities. Our living and learning villages provide an environment in which students can pursue their academic goals in close partnership with mentors, professors, and others who share the same interests. Following are brief descriptions of our villages. For more information on each village, please visit our website at www.ncsu.edu/housing.

Alexander Global Village
The Alexander Global Village introduced international students to American culture, exposes American students to other cultures and makes the entire community aware of global issues. Students who choose to live in the Alexander Global Village are those interested in living and interacting with people from differing backgrounds, experiences, countries, and viewpoints. The community's focus is one of global awareness, understanding, and experience. The program features the pairing of International students and American students as roommates, provides Student Ambassadors to assist in acclimating international students to American culture, an educational programming series on cultures of the world, discussion programs focusing on global awareness issues, and a partnership with the College of Humanities and Social Sciences (CHASS) to bring faculty into the community for discussions, lectures, and trips. These activities, in addition to an active and enthusiastic resident population, make Alexander Hall an exciting place to live. For additional information, please visit the website at www.ncsu.edu/housing/communities/agv.

Arts Village
Co-sponsored by University Housing and ARTS NC STATE, the Arts Village unites students from various personal and academic backgrounds who have a passion for the arts and exposes them to theatre, visual arts & crafts, music and dance. The Arts Village will provide students with significant and exciting opportunities to develop their creativity, engage with the arts on campus and in the community, interact with NC State faculty and staff, and serve as a creative resource for the campus community as a whole. Residents of the Arts Village attend ARTS NC STATE and Raleigh art performances/events, participate in guest artist pre-show discussions, are introduced to the business aspect of producing, art performances/events are provided with outlets for personal creativity such as hands on sessions at The Crafts Center, reserved practice room in Price Music Hall, theatre and choreography workshops, and receive priority seating in some arts related academic classes. The Arts Village provides a unique opportunity for students to develop what we hope will be a lifetime appreciation for the Arts! For additional information, please visit the website at www.ncsu.edu/housing/communities/arts.

First Year College Village
The First Year College (FYC) enables students to enter the University without immediately declaring a major, allowing a year for guided inquiry and exploration before a major is declared. Students who enroll in FYC will live in the FYC Village located in Tucker and Owen Residence Halls and will have the benefits of a more enhanced living/learning experience. This village offers a close-knit, supportive environment and opportunities for friendships, academic development, and recreation within an intellectually challenging community. For additional academic support, all First Year College Academic Adviser offices are located in the adjacent First Year College Commons. The new commons also houses the 24 hour service desk, classrooms, and a computer lab. For more information about the First Year College Village, please visit: www.ncsu.edu/fyc/prospective/village or www.ncsu.edu/housing/communities/fyc.

Students Advocating for Youth (SAY) Village
The Students Advocating for Youth (SAY) Village, located in Syme Residence Hall, is a partnership between the College of Education and University Housing where students can help better the lives of young people. No matter what your career - lawyer, teacher, doctor, psychologist, engineer or entrepreneur - it doesn't matter. Advocating for youth spans may fields of study. We are looking for students who have an interest in contributing to the community, the university, and the lives of youth. The SAY residential village is committed to providing future advocates and educators with the resources, skills and support to become successful youth advocates and critical thinkers in a multi-cultural society. Students will benefit from faculty advisers, resident mentors, field trips and interaction with under-represented students both in and out of educational settings. For additional information, please visit the website at www.ncsu.edu/housing/communities/say.

University Honors Village
Live. Create. Inquire. Discover. Learn. The philosophy of the University Honors Village demonstrates the exceptional blending between academic and student life at NC State. The University Honors Village, a partnership between the University Honors Program and University Housing, is housed in the Quad residence halls of Bagwell and Becton. Upper division Honors Mentors serve the residents of this village assisting with all aspects of village life. The Honors Mentors along with the Village Resident Advisers plan and implement activities such as cultural events, camping trips, and faculty speakers. With the University Honors Program offices located in the adjacent Clark Hall, the Quad environment is a natural fit for this village. The Honors Village Commons enhances this living and learning environment by providing programming and educational space, a computer lab, a convenience store, and a twenty-four hour service desk that make this a true community to call home during your time at NC State. More information about the University Honors Village can be found online at www.ncsu.edu/housing/communities/honors.

University Scholars Village
Centered in Sullivan Hall and based on a partnership between the University Scholars Program (USP) and University Housing, the Scholars Village offers students access to a range of social, service, leadership development and educational programming that produces a vibrant and engaging living-learning community. Much of this programming-including dinner with alumni, conversations

about current events and presentations by NC State faculty members - is designed and implemented by Scholars Village Assistants, upper division students who live in the village and serve all of its residents. Additionally, the student Scholars Council arranges an annual semiformal, an end of the year picnic, fruit and bagel nights during final exams, and many other fun activities for village residents. The USP Offices and a Scholars Lounge are located in the village.
For more information, visit www.ncsu.edu/housing/communities/scholars or www.ncsu.edu/univ_scholars.

Women in Science and Engineering Village
The Women in Science and Engineering (WISE) Village is a living and learning community designed especially for first and second-year women in the colleges of Agriculture & Life Sciences, Engineering, Natural Resources, Physical & Mathematical Sciences, and Textiles. These women represent a variety of disciplines within the five colleges. WISE provides women mathematicians, scientists and engineers the opportunity to network with each other in the classroom and beyond. The WISE Village features study groups, peer and professional mentoring, a speaker series, social and cultural events, opportunities for leadership and professional development, and more! Peer mentors live in the village and help the first-year women to get acclimated to NC State and to be academically and personally successful. For more information, please visit www.ncsu.edu/housing/communities/wise.

HONORS AND SCHOLARS PROGRAMS

University Honors Program

The University Honors Program (UHP) is a highly selective program of great expectations. The program exists to encourage and enable outstanding students to engage in research and scholarship in their chosen discipline. It is an opportunity for motivated students to craft for themselves a unique undergraduate education that draws on the full range of opportunities that exist at a major research, land-grant university such as NC State. Undergraduates can pursue research and scholarship in any discipline. In fact, there are students from every undergraduate college at NC State in the UHP.

Application to the University Honors program is by invitation only. Incoming freshman are invited to apply after they have been accepted to the University. All invitations are issued on a rolling basis from mid-January through late February. If you do not receive an invitation, but believe you are a strong candidate for the University Honors Program, you can contact us and request an invitation to apply. Admission is competitive and based on evidence of motivation to pursue research and scholarship in the discipline, academic achievement, extracurricular activities, and our desire to maintain an Honors community that includes students from a variety of backgrounds and academic majors. Priority consideration is given to students who apply to the University by the early admission deadline. Current NC State students may also be invited to apply following the first and second semesters of their freshman year.

University Honors Program students are required to take four HON seminars (generally one per semester in their first two years), which feature inquiry-guided learning and cross-disciplinary approaches, and are taught by some of the most innovative professors at NC State. These seminars are designed to help students see how knowledge is generated, to think about the ethical, historical, and societal implications of new knowledge, and to think across disciplinary boundaries. The UHP also offers experimental learning courses that enable them to earn credit for activities such as working with a faculty member on a project or with a local museum to create educational materials for a new exhibit. All UHP students culminate their undergraduate careers with a two-semester capstone project- working with a faculty member or other campus or local professionals to pursue an independent project in their discipline.

The University Honors Program cooperates with University Housing to offer the University Honors Village, a living-learning community located in the historic and recently renovated Quad residence halls on East Campus. The Honors Village gives our students the opportunity to live with other highly motivated students, to participate in informal learning activities such as trips, group discussions, and social events, and to benefit from the advice and guidance of the Honors Village Fellows, experienced UHP students who work with the incoming students.

The Honors experience at NC State includes Honors programs located in the colleges and departments. Students are invited to participate in these programs at various times, depending upon the specific program (generally the second semester of the sophomore year or first semester of the junior year). Many of the students in the University Honors Program are also participants in one or more of the college or departmental Honors programs.

University Scholars Program

"Man's mind stretched to a new idea, never goes back to its original dimension." -Oliver Wendell Holmes

Holmes was right, of course, and the University Scholars Program (USP) of North Carolina State University accepts this dictum as a challenge: To provide promising, academically talented students with a variety of mind-stretching and unique educational experiences, both in and outside of the classroom, and to encourage these outstanding students to perform at the highest level of achievement of which they are capable.

Cosponsored by the Division of Student Affairs and the academic colleges for over twenty-five years, the USP combines special courses offered by the various academic departments with a series of cocurricular and extracurricular opportunities.

Students in the USP may enroll in special sections of courses offered by departments for University Scholars and other high-achieving students. These sections frequently have lower enrollments and are taught by instructors known for their excellence in teaching. All of these classes fulfill requirements for graduation from NC State, thus students are not required to take additional

courses in order to participate in the USP. To ensure that University Scholars are able to register for their required Scholars Forum and these special courses, USP participants receive "Scholars Advanced Scheduling" privileges.

Academic work in the Scholars Program is complemented and enriched by a series of special events called the Scholars Forum. These weekly activities are intended to broaden each student's personal, professional, and cultural horizons. Forum events include addresses by major public figures, conversations with distinguished faculty members, debates and discussions on significant public issues, and visits to museums and historic sites. They also include introductions to cultural activities, viewing of significant films, and explorations of opportunities open to students for personal growth and foreign study.

From bluegrass to opera, musical comedy to Shakespeare, and foreign films to international dinners, University Scholars have access to a range of cultural opportunities, provided free through the program. Educational field trips extend the outreach of the Scholars Forum across North Carolina and into other states. Visits to internationally renowned research centers and local museums, hikes through local nature preserves, wafting trips down nearby rivers to investigate local flora and fauna, overnights trips to historic and cultural centers (Washington, DC, Charleston, SC, and Richmond, VA, for example) are regularly included as part of the Scholars Forum Series. Students may also choose to participate in the USP Book Club or weekly USP Current Events Discussion Series, or attend a specially selected USP Film Series. University Scholars also have the opportunity to participate in the USP Outdoor Leadership Series. The series develops leadership skills through rock-climbing, white-water rafting, canoeing, hiking, camping and other outdoor activities. Additionally, the Scholars Council, the student representative body for the USP, plans a variety of social activities and special trips for University Scholars, and arranges for USP students to participate in worthwhile community service projects.

To foster community and to promote student learning and socialization, University Scholars are invited and encouraged to live in the "Scholars Village" which is located in Sullivan Residence Hall. Sullivan is the home to approximately 450 University Scholars. Located on NC State's West Campus, Sullivan has its own 24-hour Help Desk and a 24-hour computer lab is located near the largest dining hall on campus, a campus convenience store, and Lee athletic field. One of the most active residence halls on campus, Sullivan is home to award-winning educational, social, and service programming provided by the Sullivan Hall Activities Council (SHAC) and the USP Scholars Council. The University Scholars Program Offices and the Scholars Lounge are conveniently located inside Sullivan Hall.

For more information concerning the USP, contact: University Scholars Program, Box 7316, NC State University, Raleigh, NC 27695-7316, phone: (919) 515-2353, fax: (919) 515-7168; e-mail: university_scholars@ncsu.edu or visit University Scholars Program website at: www.ncsu.edu/univ_scholars.

SPECIAL ACADEMIC PROGRAMS

National Student Exchange Program

The National Student Exchange (NSE) Program at NC State offers students a wonderful and economical opportunity to study at another university in the United States, while retaining full-time status at NC State University. Over 190 campuses are available for exchange, from Hawaii to Maine. Depending upon the college where students choose to study, tuition and fees may be paid directly to NC State or to the host campus at the host campus in-state rate. Students may participate in the exchange for a semester or academic year, but not summer sessions only. Exchanges are not contingent on 1:1 exchange ratio. Eligible students must be full-time undergraduates with a minimum 2.50 grade point average, enrolled full-time the semester before the exchange and be selected by a committee. For further information, contact the NSE office in 4130 Talley Student Center, (919) 513-1820, or visit the National Student Exchange website: www.ncsu.edu/nse and www.nse.org.

Non-Degree Certificate Programs

Non-degree certificate programs are prescribed sets of regular academic courses which offer limited but structured continuing education opportunities. Many are designed expressly for Lifelong Education students. Satisfactory completion of the prescribed courses is recognized by the issuing of a certificate from the department or college that offers that program. Course delivery mechanisms differ by program. Some programs utilize on-campus instruction, while others utilize Internet or videocassette delivery. The inventory of available programs changes over time in response to changing continuing education needs. The following is a sample of available programs: Computer Programming, Geographic Information Systems, Training and Development, Professional Writing, and Textiles. Several programs are designed for students who already possess a bachelor's degree.

For information concerning enrollment requirements and prescribed courses for a particular certificate program, consult the department or college offering that program or contact Credit Programs; (919) 515-3154.

The Peer Mentor Program

The Peer Mentor Program (PMP) is a student advisory program that targets first-year African American, Native American, and Hispanic students. The program, founded in 1982, recognizes the challenges first-year students face as they embark upon this new and vastly different segment of their lives. PMP acknowledges the complexity of this situation for minority students, particularly on a predominately white campus. The primary objective of the Peer Mentor Program is to ease this situation by contributing to and aiding in the adjustment of these students to the academic, emotional and social aspects of college life. From a broadened perspective, the program aims to increase and maintain the enrollment and retention of minority students, ensuring that each student maximizes his/her potential.

African American, Native American, and Hispanic upperclassmen are selected as mentors through an application and interview process and are subsequently paired with one to three first-year students. In general, the mentor maintains close contact throughout the year with his/her mentee(s) and acts as a "big brother/sister," advisor and oftentimes, as a friend. Whenever possible, freshmen are paired with upperclassmen enrolled in the same major and/or college. Through training seminars, a mandatory course and personal experience, peer mentors are prepared to assist first-year students with problems, questions and situations that may arise, or refer them to the appropriate university resources. Ultimately, the peer mentor works to ensure a smooth transition from high school to the college environment. Though it is impossible to determine all of the many benefits of the program for each individual, the Peer Mentor Program remains rewarding, both intrinsically and extrinsically, for first-year students as well as mentors.

This program is coordinated by The Department of Multicultural Student Affairs, call (919) 515-3835 for more information.

Supplemental Instruction

Supplemental Instruction (SI) is a series of weekly review sessions for students in selected sections of historically difficult courses. SI is provided for all students who want to improve their understanding of course material and improve their grades. At each session, students are guided through material by an SI leader, a competent student who has previously taken the course. Three or four sessions are offered at various times each week, usually during the late afternoon and early evening. Attendance is voluntary. A schedule of sessions can be found on the SI website www.ncsu.edu/si.

INTERNATIONAL PROGRAMS AND ACTIVITIES

International Students

The Office of International Services (OIS) is charged with meeting the immigration advising and cross-cultural programming needs for the university's 2,000 international students and 300 J-1 Exchange Visitor scholars who come from more than 110 different countries. Services provided by OIS include advising students and scholars on immigration regulations and university policies; authorizing certain types of on or off-campus employment authorization for F-1 and J-1 visa holders; and providing cultural programs designed to enrich the cultural and academic experience of international community: New International Student Orientation, Culture Corps, I-SSERV volunteer program, English Conversation Club, cultural diversity workshops, and other programs. New international students are required to participate in New International Student Orientation and to check-in with OIS upon arrival. OIS also provides opportunities for U.S. students to get involved in the international community at NC State by inviting participation in various cross-cultural programs such as volunteering at orientation, English Conversation Club, International Friendship Program, etc.

International applicants must apply to the Admissions Office by the stated deadlines and must meet all the necessary requirements for admission. In addition, international applicants must meet certain language and financial criteria (see the TOEFL and Financial Information sections under Freshman Admission).

The North Carolina Global Training Iniative (GTI) sponsors several short-term certificate programs that international students may be interest in. These full-time non-degree study programs allow international students to study at NC State for one semester in order to learn about U.S. culture and education, improve their English, take undergraduate courses in their field of study back home, prepare for possible graduate study in U.S., experience life in Raleigh, and perhaps engage in a part-time internship on or off campus. Please call 919.513.0105 or visit us on the web at www.ncsu.edu/gti for more information.

Outline of minimum immigration requirements for F-1 and J-1 students:

- Keep all immigration documents current (passport and I-20 or DS-2019)
- Maintain full-time enrollment every semester (12 hours/semester for undergraduates)
- Make good academic progress toward your degree
- Do not work or intern off campus without prior written approval from OIS
- Do not work on campus more than 20 hours in any one week during the semester
- Update any address change in Pack Tracks within ten days of moving
- Update OIS immediately of any change in name, visa status, or marital status
- Consult with an OIS adviser BEFORE changing curriculum/majors, withdrawing, dropping below full-time, transferring to another school/program, etc.
- Purchase and maintain the NC State University Student Health and Accident Insurance
- Be sure to keep your passport and recently signed visa certificate (I-20 or DS-2019) with you when you travel abroad. Consult with an OIS adviser about visa and travel questions

Further information about immigration requirements and restrictions are detailed on the OIS website. For individual advising, please call (919) 515-2961 to make an appointment with an adviser.

Office of International Services (OIS)
320 Daniels Hall, 101 Lampe Drive
Campus Box 7222
NC State University
Raleigh, NC 27695-7222

phone: (919) 515-2961
e-mail: ois@ncsu.edu
website: www.ncsu.edu/oisss/

Summer Institute in English for Speakers of Other Languages

The Summer Institute in English for Speakers of Other Languages is a five-week, intensive English language program for students from other countries. It is especially good for students from other countries who intend to pursue university studies or specialized training programs in the United States in the fall. The institute, which is jointly sponsored by the Department of Foreign Languages and Literatures and the Division of Continuing Education, is held from early July to early August each summer. It is designed to provide students with intensive instruction and practice in the use of the English language. Emphasis is on developing integrated oral and written skills in English.

The institute also offers orientation to American life and institutions to give students insight into life in the United States and to help them to adjust to the new environment. There are films and field trips to places of historic, cultural, and scenic interest. Prospective students usually have studied English and have some experience with spoken English prior to enrolling in the institute. However, all levels from beginners to advanced are welcome. Admission to the institute does not imply admission as a degree candidate at NC State or any other campus of the University of North Carolina System.

The TOEFL (Test of English as a Foreign Language) is administered to students who wish to take it at the end of the program. Since this is an institutional administration of the test, scores are only accepted by the Admissions Office and Graduate School at NC State. For information, contact Dale Mackey at (919) 513-0886 or dale_mackey@ncsu.edu.

Alexander Global Village

The Alexander Global Village (located in Alexander Residence Hall) is a residential option for students who wish to live in a diverse and exciting environment. The community is comprised of students from over 20 countries with diverse backgrounds, experiences, and viewpoints. The overall focus is one of global awareness, understanding, and experience. It is typical to find students cooking native foods in the community kitchen and conversing in native languages while educating others about their cultures. Resident Advisers (RAs), Alexander Ambassadors (AAs), and Hall Council members are active in planning programs and activities that develop the community, such as cultural dinners, international movie nights, topical discussions with faculty, and excursions around Raleigh and beyond.

Alexander Global Village (AGV) strives to introduce International students to American culture, expose American students to other cultures, and make the entire community aware of global issues. Space is limited to 163 beds, so students must complete an application for acceptance into AGV. Any NC State student may apply to live in AGV; assignments are made on a first come, first served basis with a number of beds held for our International Study Abroad students. Our aim is to have equal representation of the International student population and the American student population living in AGV. To enhance the experience, International students and American students are paired to live together as roommates. The majority of residents in AGV are upper division and graduate students, although freshmen are welcome to apply and will be paired with other non-international freshmen.

Students choosing to live in AGV are expected to be active participants, to initiate activities, and to be supportive of the program goals. Students interested in applying or wanting additional information should visit www.ncsu.edu/housing/communities/alexander.

Study Abroad

The Study Abroad Office assists students who would like to study or do an academic internship in another country. Opportunities are available for the summer, semester, or year. Many programs cost about the same as studying at NC State. The Study Abroad Office administers approximately $100,000 in campus-based scholarships for study abroad each year, in addition to national scholarship competitions such as NSEP, IIE, and Gilman. Students may also use their financial aid to study abroad.

Study Abroad Programs

Study abroad allows students to take course work overseas in their major and/or minor field, and/or fulfill general education requirements. Spring break options are occasionally available for one credit, or integrated into a semester length course on campus. Most programs have no foreign language requirement. The Study Abroad Office will also assist students who wish to study on a program sponsored by another university or organization to obtain academic credit for such programs. NC State sponsored study abroad options include:

Exchanges sponsored by NCSU, The University of North Carolina Exchange Program (UNCEP), and the **International Student Exchange Program (ISEP)** are available in Asia, Australia, Europe, North, Central, and South America, and the West Indies. Students on these exchanges pay regular NC State tuition. Room and board costs vary, depending on the study abroad location. Requirements include a GPA of at least 2.75 (some exchanges require a 3.00) and at least intermediate level (through 202) language proficiency for programs in which the language of instruction is not English.

Non-exchange study abroad programs are available as **individual or group programs. Non-exchange - individual programs** offers students full immersion in the host culture where one enrolls directly into a foreign partner university through its study abroad office. Students pay the host university's tuition and fees, which may be most cost-effective for out-of-state students. Examples include direct enroll at some partner schools in Australia and at USFQ in Ecuador.

Non-exchange - group programs are arranged so that a group of students from NCSU go abroad and take classes together, often led by a faculty member. Examples of Non-exchange group programs include Semester in Spain, Semester in Florence, and Semester in Prague. Some programs offer homestays for increased cultural immersion, others place students in apartments or student residences with U.S. and international students. Requirements include a GPA of at least 2.75 (check NC State Study

Abroad website for specific program GPA requirements) and completion of at least the 202 level of Spanish for the Ecuador program.

NC State Group Summer or Break Study Abroad Programs, directed by NC State faculty, are offered during the summer every year, and sometimes during spring/fall breaks. There are over 30 NC State sponsored programs offered each summer. Students on these programs pay a set program fee, which generally covers tuition, housing, some meals, and excursions, although the details vary from program to program. Eligibility requirements vary, but many programs are open to students in good academic standing (2.0 GPA) who have completed the freshman year. Students typically earn 3 or 6 hours of credit on summer programs. The programs below are scheduled for summer 2007. For the full list of programs for the current year contact the Study Abroad Office at study_abroad@ncsu.edu or see the website studyabroad.ncsu.edu.

Africa

Accra, Ghana, West Africa. In this 5-week program, students will receive six credit hours from NC State University for the courses "Ghanaian Culture and Society" and "Social and Psychological Issues in Contemporary Ghana." Co-curricular lectures and seminars by Ghanaian scholars will introduce students to important information on Ghana's history politics and economy. As an integral component of the program, all students will receive instruction in the "Twi" (Akan) language. Courses will be taught by faculty from NC State and from the University of Ghana at Legon.

Kumasi, Ghana, West Africa (Collaborative Studio). Courses on this month long program, will be taught by a distinguished group of faculty from the College of Art at the University of Science and Technology, Kumasi, and the College of Design, NC State University. Students are able to combine intensive studio work and travel throughout Ghana to conduct on-site field studies. Each site serves as an extension of the classroom, providing opportunities to observe and participate in creating traditional African artifacts. Students enroll in ADN 490 - Art & Design International Studio for a maximum of 6 credit hours. This program is offered every other year.

Kumasi, Ghana, West Africa (Landscapes in Ecotourism). This program provides an academic experience that focuses on ecotourism, preservation of cultural resources, community development and the Ghanaian tourism system. In addition, the curriculum runs parallel to the College of Design track, focusing on traditional and contemporary African art, design, and landscapes. Students will participate in a joint charette with the design and LA students and will also attend seminars at the University of Cape Coast. The course will tour the southern regions of the country, offering rich first-hand experiences with the many settings, traditions, and people of Ghana. Students will earn 3 credits in Parks, Recreation, and Tourism Management.

Maun, Botswana. This program is designed for students with an interest in African natural history, ecology, and conservation. It provides students with the opportunity to study and experience the African savanna ecosystem and its magnificent wildlife first hand. Students will visit Botswana's diverse ecosystems and some of the well known protected areas during the course of this program. Additionally, students will also have the opportunity to meet with field biologists of a research institute where they will learn more about the ecology and conservation of northern Botswana. Students will earn 3 credits in Fisheries and Wildlife Sciences.

Americas

Agroecology in Tropical America, Costa Rica. This program will provides a valuable hands-on experience in examining the environmental, economic, and cultural aspects of tropical agriculture. Through a combination of farm visits, hands-on activities, hikes, and research projects, students learn how to evaluate the environmental, social and economic sustainability of these production systems from first-hand experiences and contact with Costa Rican citizens. Students earn 3 credits in Crop Science.

Sucre, Bolivia. Designed for students from all disciplines who are interested in pursuing Spanish language study and learning about South American culture, students on this program will utilize the city of Sucre and the surrounding area to explore language and culture. Learn the present culture and traditions of Bolivia and how they compare to those of the past and earn up to six Spanish credits.

Carriacou, Grenada. Located in the Caribbean, this program will teach students the fundamental skills required of archaeologists when conducting survey and excavation. NC State students work closely with students from Great Britain and the Netherlands to collect, examine and record cultural remains from sites on the island, while enjoying the beauty of the Caribbean. Students earn 6 credits in anthropology.

Cuernavaca, Mexico. Students have the opportunity to study Spanish and Mexican Culture at the Universidad Internacional in Cuernavaca, and immerse themselves in the culture and language of Mexico by living with a family. The program includes multiple day trips to places of historic and contemporary interest. Students earn up to 6 credits in Spanish language and literature.

Cuzco/Lima, Peru. This six-week program begins with a twelve-day travel study focusing on the Incan and colonial heritage of Peru, including visits to Macchu Picchu and Cuzco. The travel study is followed by four weeks of study in Lima. There, students will live with local families and make several field trips to surrounding areas. Six credit hours are available in Spanish literature and Latin American studies.

Lake Atitlan, Guatemala (Anthropology). This is a 7-week program of intensive ethnographic fieldwork focusing on the problems of sustainable eco-tourism in Guatemala. During the program, students spend time living with Guatemalan

families in the Lake Atitlan area of the Western Highlands. The focus is on ethnographic methods and learning about the socio-cultural and economic issues surrounding Guatemala's tourism industry. Courses are taught in English.

Lake Atitlan, Guatemala, (Social Work). Students will enhance their provision of social work services to Latino clients through learning Spanish language, culture and social service responses and solutions in Guatemala. During the program, students live with a Guatemalan family in the Panajachel area. In addition to course work earning up to 6 credit hours, students spend time each week in a hands-on service learning/research experience working in a governmental, neighborhood or community organization.

Asia

Hangzhou, China (Plant Resources, People and Religion). Through lectures and field trips to nearby mountains for the collection and identification of plants, students will examine natural plant resources, people and religion in Hangzhou and adjacent areas of China. Students from Zhejiang University will join the group during lectures and fieldwork to enhance cross-cultural exchange during lectures and fieldwork to enhance cross-cultural exchange during this 3 week Plant Biology program.

Hangzhou, China (Summer at Zhejiang). The program at Zhejiang University in Hangzhou, China provides the perfect balance of coursework and cultural immersion. Classes are taught in English by NC State faculty. Students can fulfill general education, business, and engineering requirements. The program includes special cultural activities and excursions, including a weekend in nearby Shanghai.

Australia

Cairns, Australia. This unique program provides students the opportunity to spend 3.5 weeks in North Queensland, Australia examining the natural history, related social history, and environmental conservation of the area. The first week of this program is based in Cairns, in the Tropical Far Northeast, with classes held on the campus of James Cook University and in the field with several full-day and half-day trips to local regions in and around Cairns. These trips will focus on the interaction of human cultures, including indigenous Aborigines lifestyles, and the natural environments. Students will then spend two weeks on travel-study through North Queensland, exploring the network of national parks, reserves, off-shore islands, and coastal areas. The program will conclude in Cairns with completion of coursework and additional field trips.

Melbourne, Australia. The Month in Melbourne program provides students with the opportunity to study at one of the finest universities in Australia - the University of Melbourne, while earning NC State credit. Course work allows students a first-hand look at the historical and contemporary development of Australian culture and identity through the "Face, Place and Race" course. Students also will use the incomparable Australian places and people as material for their writing in the travel journalism course. Students will travel from the U.S. to Sydney, Hobart, and the Grampians national park before settling into the University of Melbourne's Trinity College.

Queensland, Australia. This program provides students the opportunity to spend four weeks in Australia studying Australian culture, wildlife, vegetation and agriculture. The program begins with two weeks at the University of Queensland's Gatton Agricultural Campus where students will be introduced to a variety of livestock and agricultural farming practices. In addition to a variety of farm visits, students will learn about Koala conservation, as well as see first-hand the practices of a major trading partner of the U.S. Students will spend the final two weeks of the program at the University of Queensland's main campus, one of the most scenic campuses in Australia. Here, students will continue to learn about the Australian farming system, farm animals, wildlife and vegetation. In addition, they will be introduced to Australian history, aboriginal culture, politics and art.

Europe

Burgundy, France. Study French painting, sculpture and architecture from the middle ages through the Renaissance. Study original pieces of art and receive instruction on the function, patronage and influences on those works. In Burgundy, site visits will include the Cistercian abbey at Fontenay, the Crusader church at Vezelay, the village of Flavigny (where the movie Chocolat was filmed), the tombs and art collection of the Dukes of Burgundy in Dijon, and the chateau of Bussy-Rabutin, built by an aristocrat exiled from the course of Louis XIV. In Paris, site visits will include Notre Dame and St. Chapelle, Versailles, the Louvre, and the Musee d'Orsay.

Cuper, Scotland. This program is specifically designed for Professional Golf Management majors and will provide students with an in-depth, comparative view of golf practices and culture in Scotland. Students will be housed at Elmwood College and will receive guest lectures and facility tours throughout the area. Participants will earn 3 PRT credits in Comparative Golf Management Practices in Scotland.

Florence, Italy. This program is sponsored by the University Scholars Program. The magical, historic city of Florence is the backdrop for students to explore topics in history, architecture, philosophy, politics, artistic movements and civic life of the Italian Renaissance period. Six credits are available through a variety of courses including art history, studio art, and Italian language, taught in English by the outstanding faculty at the Lorenzo de Medici Institute. The course "Italian Renaissance Civilization and Culture" is required for all participants.

Lille, France. The Lille program is designed for students interested in studying French language and culture, plus arts or politics, while immersing themselves in the French environment. The program begins with an eight-day study tour in Paris. Expected visits include bike and boat tours of Paris, the major museums and monuments, and day trips to Giverny and Fountainebleau castle. Next, a three-day trip to Normandy is planned with visits to Mont Saint Michel, Bayeux, Caen, and

the D-Day Beaches including the Arromanches Debarkment Museum, Omaha Beach and the American Military Cemetary. After completing the travel study tour, the group will travel to Lille for the remaining four weeks of the program.

London, England. This program allows students to live in the heart of London while studying the history and archeology of Roman Britain. Students will take an intensive 6-credit history course on Roman Britain, HI 395. Program components include visits to museums and exursions to famed archeological sites such as Hadrian's Wall. Students reside and study at Canterbury Hall, a University London residence hall located in the Bloomsbury section, within walking distance of the British Museum, Charles Dickens House, and the theatre district. The 2008 London, England program will have a dual historical focus on Paris and London and will travel to both cities.

Oxford, England. This program offers courses entitled "Shakespeare," "Art Treasures of Oxford," and "Britain since 1930," all taught by British instructors. Students reside and study in Somerville Hall, a permanent private hall of Oxford University. A country town and industrial center, Oxford is best known as the seat of Oxford University, England's oldest university, and is celebrated for tradition, academic excellence and beautiful architecture.

Poznan, Poland. The Poznan, Poland program is sponsored by the College of Agriculture and Life Sciences (CALS) and is designed for students interested in biotechnology or pre-med. In Poznan, students will utilize the city and surrounding area to explore science, history, and culture. The program will be housed at Adam Mickiewicz University (AMU) and students will have the unique opportunity to interact with local English-speaking Polish university students. The classes, exursions, and field trips offered will encourage the students to learn more about this new member of the European community but the oldest country and culture in Europe.

Prague, Czech Republic. Located in Prague, one of Europe's most beautiful and historic cities, location offers several summer programs in different fields of discipline. The following are the 6-week programs offered at the Prague Institute: Animation Studio, Industrial Design Studio, Physics, General Electives, and Graduate Accounting and Management. All courses are taught in English.

Segovia, Spain. The Segovia program is designed for engineering majors/minors. Segovia, a small city 55 miles northwest of Madrid, has a unique historical mixing of diverse cultures. It is an ideal setting for students who are considering the relationship between technology and culture and in finding their place in our global society. Classes encourage the ability to use the Spanish language in authentic settings and allow students to study and experience the rich culture of Spain. Students take two courses for a total of six credit hours.

Turkey. This three-week study abroad program offers students the chance to visit Istanbul, Troy, Ankara, the Cappadocian Region, and Analya province, while earning 3 credits in Forestry and Natural Resource Management. The program will include site visits to ongoing forestry operations, national parks, and forests to assess management techniques incorporating various interests. The group will make visits to active research trials with Turkish scientists and will expose students to the historical and cultural aspects of Turkey.

Vienna, Austria. The Vienna program is sponsored by the College of Humanities and Social Sciences (CHASS) and the Department of Foreign Languages and Literature. Students will have the opportunity to spend 4 weeks in one of the cultural centers of Europe. The program offers one German Language Course (any level) and one course on arts and culture of Vienna around 1900. The program is run in conjuction with IKI (Internatinales Kulturinstitut), and all courses will take place at the IKI center in the heart of Vienna. The program will include a walking tour of the old town of vienna and a city tour. We will do an overnight trip to Salzburg, the birthplace of Mozart. Prague, capital of the Czech Republic, with its famous castle and its historic down town is another destination of a weekend trip. Students will have time to explore Vienna and Austria on their own.

The NC State sponsored Study Abroad Group Summer Programs vary by year and some programs may not be listed here as they are offered every other year. For the most up to date information, please visit our website at studyabroad.ncsu.edu.

STUDENT SERVICES

Bookstores

The official campus source for all course books is the NC State Bookstore, consisting of the main store, located on East Dunn Avenue, the North Campus Shop, located in the lower level of Erdahl Cloyd Annex of the D. H. Hill Library, and the Century Shop located in Research III, Centennial Campus. At the main store, the book division provides textbooks, fiction, nonfiction, technical and reference titles, publishers' overstock and remainders, college outlines, paperbacks, book reviews, periodicals, and calendars. The merchandise division carries school supplies, personal computers with accessories and supplies, art and engineering supplies, greeting cards, health and beauty aids, imprinted sportswear, souvenirs, and convenience items. Special orders are accepted for books and merchandise. Purchases may be charged by VISA, MasterCard, Discover, American Express, or AllCampus Money Card. Textbooks may be ordered online at the beginning of each semester from the website: www.ncsu.edu/bookstore.

During the opening of fall and spring semesters, the main store is open specified evenings, in addition to each Tuesday evening and Saturday when classes are in session. North Campus Shop specializes in computer supplies, sale books, magazines, souvenirs, gifts, and convenience items. The entire operation of the Bookstore is completely self-supporting, with its annual surplus transferred to the NC State Scholarship Fund.

Campus Recreation

The mission of the Department of Campus Recreation is to provide diverse opportunities for the campus community of NC State University and expand the knowledge of and participation in recreational activities, which foster healthy lifestyles, sportsmanship, teamwork, and leadership. The department is composed of the following activity programs: Club Sports, Fitness, Intramural Sports and Outdoor Adventures.

Club Sports

A sport club is a registered student organization formed by individuals with a common interest in a sport or activity that exists to promote and develop interest in that particular activity. Clubs may be instructional, recreational, competitive, or some combination thereof. Characterized by being student-initiated and student-managed, the basic structure of sport clubs allows members numerous opportunities for leadership. There are currently 42 affiliated sport clubs: Aikido, All-Girl Cheerleading, Badminton, Baseball, Basketball (W), Bass Fishing, Cricket, Cross Country/Track, Cycling/Mountain Biking, Dance Team, Disc Golf, Equestrian, Fencing, Field Hockey, Gymnastics, Ice Hockey, Lacrosse (M&W), Martial arts, Outing, Rodeo, Roller Hockey, Rowing, Rugby (M&W), Sailing, Ski & Snowboard, Soccer (M&W), Social Ballroom Dance, Softball, Swimming, Table Tennis, Tae Kwon Do, Tennis, Triathlon, Ultimate (M&W), Volleyball (W), Water Polo, Water Ski/ Wakeboard, Wrestling.

Fitness

There are approximately 56 hours of Group Fitness classes each week during the academic year and approximately 15 hours in the summer. Classes like step, hi/lo, cardio-boxing, groove-ology, raise the bar, Pilates, yoga, Absolutions, water fitness, and yogalates classes allow diverse and energetic opportunities to help participants meet their fitness goals. In addition, wellness workshops are offered that provide knowledge about current topics in the fitness industry such as: injury prevention, time and stress management, relaxation and massage, nutrition, eating disorders, yoga, beginning a workout program, weight training, body composition assessment, and goal setting.

Intramural Sports

Intramural Sports is composed of activities (team sports, individual/dual sports, and special events) that are designed to provide organized recreational participation for everyone! The core activities offered include basketball, flag football, soccer, softball, volleyball, bowling, golf, tennis, table tennis, badminton, and racquetball.

Outdoor Adventures

Outdoor Adventures offers adventure-based trips, educational workshops, climbing on the Rock Wall, and outdoor rental equipment. Adventure trips such as sea kayaking, white water rafting, caving, hang gliding, backpacking, and canoeing are offered. Educational Workshops include topics such as wilderness survival, back country cooking, rock climbing, and map & compass skills. Equipment rentals include: tents, backpacks, sleeping bags, lanterns, stoves and canoes. Rock Wall includes: offering Belay clinics and designated hours for recreational rock climbing at the indoor rock-climbing wall located in Carmichael Gymnasium.

The Department of Campus Recreation is located in Carmichael Gym, Room 1000. For more information, please see the following website: www.ncsu.edu/campus_rec.

The University Career Center

The University Career Center's goal is two-fold: to assist students in developing their career objectives and to provide resources that link students to the employment world. The University Career Center offers assistance to students at the university on a year-round basis.

Services provided by the Career Center are designed to meet the needs of all students, from freshmen to graduate students, in their various stages of career development. Career counselors provide individual counseling as well as campus wide, career-planning workshops that cover topics such as resume development and interview strategies. In addition, the center helps students find internships, summer, part-time, and full-time jobs related to their career objectives. Center staff members promote, arrange, and coordinate job interviews between students and employer representatives, schedule visits of recruiters to campus, refer employers to view students' on-line resumes, and maintain job vacancy announcements. The Career Center maintains career and job information on-line and through its library.

The Career Center is located in 2100 Pullen Hall and online: www.ncsu.edu/career.

Chaplains' Cooperative Ministry

Ann Pearce, Director
3106 Talley Student Center
Box 7306, NC State 27695

phone: (919) 515-2414
e-mail: acpearce@ncsu.edu
website: www.ncsu.edu/student_affairs/chaplains/index.html

The Chaplains' Cooperative Ministry at NC State is an interfaith organization which both supports individual campus ministries and plans jointly sponsored interfaith programs for students, faculty, and staff. Its members, both ordained and non-ordained, strive to be leaders within the university as inquiry and dialogue are engaged with trust at all levels. The office has a prominent location on the third floor of the Talley Student Center. Ministries within member groups support the spiritual and emotional growth of students through scriptural studies, worship, meals, socials, various outings, retreats, mission trips, counseling, service projects, and opportunities for leadership. Following is a list of current phone numbers and addresses:

University Liaison
Michael Giancola
3115 Talley, Box 7306, Raleigh, NC 27695
515-9248; e-mail: mike_giancola@ncsu.edu

Baptist Student Union
Charity Roberson
2702 Hillsborough Street, Raleigh, NC 27607
834-1875; e-mail: bsu4raleigharea@yahoo.com

Campus Christian Fellowship
Neal Alligood
PO Box 5182, Raleigh, NC 27650
602-4244; e-mail: noalligo@unity.ncsu.edu

Campus Crusade for Christ
Mike Mehaffie
1912 Myron Drive, Raleigh, NC 27607
782-3393; e-mail: michael.mehaffie@uscm.org

Catholic Campus Ministry (Doggett Center for Campus Ministries)
Fr. Alex Gonzalez
600 Bilyeu Street, Raleigh, NC 27606
833-9668; e-mail: jagonza3@ncsu.edu

Chi Alpha Christian Fellowship (Assemblies of God)
Brian Hargett
17 Enterprise Street, Raleigh, NC 27607
821-9823; e-mail: ncsuxa@aol.com

Disciples Student Fellowship
Rev. Rob Morris
718 Hillsborough Street, Raleigh, NC 27603
832-3953; e-mail: rob@hillyerchurch.org

Episcopal Campus Ministry
Rev. Deborah Fox
2208 Hope Street, Raleigh, NC 27607
834-2428; e-mail: deborah.fox@ecm-raleigh.org

Grace Community Church
Rev. Berk Wilson
201 Coorsdale Drive, Cary, NC 27511
467-7670; e-mail: graceforyou@juno.com

Hillel - Jewish Student Life
Valerie Kolko
201 West Cameron Ave; Chapel Hill, NC 27516
942-4057; e-mail: valerie@nchillel.org

InterVarsity Christian Fellowship
Amy Phillips
116 Burkwood Lane, Raleigh, NC 27609
673-5317; e-mail: amy_phillips@msn.com

InnerWeave Ministries (St. John's M.C.C.)
Rev. Belva Boone
805 Glenwood Avenue, Raleigh, NC 27605
834-2611; e-mail: pastor@stjohnsmcc.org

Lutheran Campus Ministry (ELCA)
Rev. Beverly Alexander
2723 Clark Avenue, Raleigh, NC 27607
828-1433; e-mail: LCM-Raleigh@att.com

Lutheran Student Fellowship (LCMS)
Rev. Kevin Martin
1500 Glenwood Avenue, Raleigh NC 27608
832-8822, e-mail: vicar@oslcraleigh.org

Navigators
Todd Harrison
228 Mediate Drive, Raleigh, NC 27603
274-5532; e-mail: rh0707@gmail.com

Presbyterian Campus Ministry (USA)
Rev. Allen Proctor
27 Horne Street, Box 5635, Raleigh, NC 27650
834-5184; e-mail: allen@wrpc.org

Reformed University Fellowship (PCA)
Rev. Jeff Wilkins
801 E. Lane St., Raleigh, NC 27601
889-9230; e-mail: jwilkins@ruf.org

Wesley Foundation (United Methodist)
Rev. Kirk Oldham
2503 Clark Avenue, Raleigh, NC 27607
833-1861; e-mail: raleigh-wesley@nccumc.org

Interfaith Coalition

The Interfaith Coalition is sponsored by the Chaplains' Cooperative Ministry and is made up of leaders who represent registered religious groups at NC State. All members are proponents of inquiry, dialogue, and truth, and while not denying the truths of their own traditions, willingly cooperate with and support the other members in the development of their communities.

Baha'i Club
Dominic Scimeca
4529 Inwood Road, Raleigh, NC 27603
931-9409; e-mail: bahais_ncsu@hotmail.com
www.ncsu.edu/stud_orgs/bahai

Latter-day Saints Institute of Religion
Eric Marlowe
6 Enterprise Street, Raleigh, NC 27607
833-3484; e-mail: marloweek@ldsces.org
www.ldsces.org/institutes

Muslim Student Association
Yasmin Sadiq
PO Box 5564, Raleigh, NC 27650
622-5009; e-mail: ncsumsa@gmail.com
www.ncsumsa.org

Self Knowledge Symposium
Blake Pemberton
1110-302 Carlton Avenue, Raleigh, NC 27606
413-7966; e-mail: wbpember@ncus.edu
www.selfknowledge.org

SGI - USA (Buddhist)
Padmini S. Hands
6307 Chapel Hill Road, Raleigh, NC 27610
832-5083; e-mail: phands@gmail.com
www.sgi-usa.org

Unitarian Universalist Fellowship of Raleigh
Rev. Tom Rhodes
3313 Wade Avenue, Raleigh, NC 27607
781-7635, e-mail: minister@uufr.org
www.uufr.org

Counseling Center

The Counseling Center assists individuals in gaining a better understanding of themselves. Psychologists, professional counselors, and psychiatrists are available to work with students who desire assistance with concerns such as choosing a career, academic planning, identifying and overcoming educational difficulties, developing greater self-understanding, developing more satisfying personal relations, and coping with stress or emotional crisis. All counseling is strictly confidential.

In addition to individual counseling, workshops and support groups are offered throughout the year in a variety of areas, including vocational exploration and stress reduction.

The Counseling Center is located in the Student Health Center, 2815 Cates Avenue, 2nd Floor. Appointments may be scheduled by coming by the Counseling Center or, if that is not possible, by calling (919) 515-2423. Additional information about Counseling Center services can be found at: www.ncsu.edu/student_affairs/counseling_center.

Disability Services

The Disability Services Office (DSO) facilitates accommodations and services for individuals with documented disabilities and serious medical conditions. Accommodations and services are rendered based on the individual's documented needs and are determined through an interactive process. DSO will maintain appropriate confidentiality of records and communication regarding disability. To receive accommodations and services, please contact the DSO as far in advance as possible. The DSO office is located in the Student Health Center, 2815 Cates Avenue, Suite 1900, phone: voice - (919) 515-7653, TTY - (919) 515-8830, fax: (919) 513-2840, website: www.ncsu.edu/dso.

Food Service

University Dining, the university's food service department, has 18 campus locations to serve students, faculty, and staff. Awarded the Ivy Award by Restaurant & Institutions magazine in 1988, University Dining is recognized nationally for exciting and innovative concepts in campus dining.

Fountain Dining Hall, located on West Campus and East Campus Dining Hall, located on East Campus serve as the main hubs for the meal-plan program. Both Dining Halls offer patrons an all-you-can-eat menu in a modern, comfortable atmosphere that breaks from the traditional cafeteria-style service. The Dining Halls are open seven days a week, with brunch and dinner served on weekends. A registered dietician is on staff to assist with dietary restrictions and to provide nutritional or diet counseling.

Meal Plans

Freshmen who live in the residence halls are required to participate in one of many University Dining meal plans, each tailored to meet different needs. All six meal plans are designed with both structure and flexibility. The structured element of the program is a set number of meals served in an all-you-can-eat fashion in the Dining Halls. The flexible element is a Board Bucks system. Part of the meal plan purchase price is directly converted to a non-refundable Board Bucks account that can be used only at University Dining locations on campus. Board Bucks are a dollar-for-dollar equivalence built into each meal plan to allow students the flexibility of eating meals away from the Dining Halls. The meal program is designed to allow students to choose the number of structured meals and the amount of flexible Board Bucks.

University Dining takes pride in offering quality food and services designed specifically to meet the wants and needs of students. These six meal plans provide students with varied menu choices and the utmost in convenience. For more information on meal plans contact the AllCampus Office, West Dunn Building, (919) 515-3090 or visit our website at www.ncsudining.com.

Health

The university seeks to safeguard the health of the students in every way possible. Student Health Services, located in the Student Health Center, offers medical care to students on an outpatient basis. The facility is staffed by full time Board certified physicians, physician extenders, registered nurses, and other medical support personnel.

Health Services is open for outpatient medical care from 8 a.m. to 9 p.m., Monday through Friday (open 9 a.m. Tuesdays), and 8:30 a.m. to 11:30 a.m. on Saturdays (for urgent care) during fall and spring semesters (excluding breaks). Physicians maintain regular office hours Monday through Friday (8 a.m. - 4:30 p.m.) and are on call at other times. A nurse staffed clinic is operated during weekday evenings (4:30 p.m. - 9 p.m.). Patients are seen by appointment (919) 515-7107; Women's Health (919) 515-7762. Summer session hours are Monday through Friday, 8 a.m. to 4:30 p.m. with no after hours services. The main number is (919) 515-2563 or visit www.ncsu.edu/student_health.

All registered students pay a health fee which covers outpatient professional services; i.e. visits to a nurse or physician, some laboratory procedures, some medications available in the pharmacy, visits to the Counseling Center and to Health Promotion. There is a charge for x-rays, most lab tests, allergy injections, prescription medications and special clinics. Students are responsible for the cost of medications in the student pharmacy, and expenses incurred when referred to an off-campus laboratory, physician, hospital, or pharmacy. All health and medical information is confidential and is not divulged to anyone without the written consent of the patient.

Health Educators offer a variety of information, programs, and services to students. Health topics include weight control, alcohol and drug education, stress management, sexually transmitted diseases, women's issues, violence prevention, and more. Call (919) 515-WELL (9355) for information. A health minor is offered jointly with the Physical Education department. Healthy State focuses on "eat smart & move more" with a resourceful website at www.ncsu.edu/healthystate.

Medical Insurance

The university offers students a medical insurance program to purchase. The insurance covers the surgical, accident, and hospital needs of participating students as a supplement to Student Health Services. Each year complete information is available to students at the start of the fall and spring semesters. Students are strongly encouraged to have medical insurance protection of some type.

Transportation

Permit Application
All students (including Freshmen) living on or off campus are eligible to apply for parking permits when registering for courses on Pack Tracks. Freshmen are encouraged to apply for parking in case permits are available after fulfilling upperclassmen demand. Resident freshmen who do not need daily access to their vehicle, but desire access for weekend trips home, may want to apply for an "S" (Storage) permit. The storage lot is served by the university bus service, Wolfline. Demand for parking permits exceeds availability; permits are assigned based on class seniority, space availability, date/time of application and permit availability. Permit application is required, but applying does not guarantee you will be offered a permit.

When registration closes, a permit application link opens on the Transportation website **www.ncsu.edu/transportation**. Instructions on the homepage will guide you through Transportation's secure application, purchase and permit pickup process. Please make sure your e-mail address on file with Registration and Records is correct and current; we will communicate with you through this e-mail address.

Parking Enforcement
Appropriate parking permits must be displayed between the hours of 7 a.m. - 5 p.m., Monday through Friday (resident zones are enforced until midnight, Monday through Thursday). Permits are not required after 5 p.m. in any unreserved space/lot. Never park in "24-hr. reserved," accessibility spaces, fire lanes, or "no parking at any time" areas. Students are strongly encouraged to join the Packparking Listserv for the latest news and information about parking permits, construction projects, road closings and more.

Wolfline (Buses)
All Wolfline buses are accessible and equipped with the Transit Visualization System (TVS) which allows you to see your real-time bus location online. No fare is required. Service frequency varies, but generally daytime service is available every 10 - 15 minutes. Wolfline buses run every day classes are held and during exams. They provide intra-campus service, service to the McKimmon Center, park and ride lots and surrounding areas along the routes. There is no bus service on official university holidays. Rt. 6 Vet School, Rt. 7 Wolflink Shuttle, and Rt. 8 Southeast Loop continue to operate every day that faculty and staff report to work. Please visit the Wolfline website **www.ncsu.edu/wolfline** for the most up-to-date information about park and ride lots and locations, bus routes and schedules. Free parking is provided (no permit required, but no overnight parking) in park and ride lots. For the latest Wolfline news, join the Wolfline Listserv, contact 515-WOLF[2] or the Transportation Office.

City/Regional Buses
The U-Pass program allows students to ride the city buses, Capital Area Transit (CAT) and the regional buses, Triangle Transit Authority (TTA), for no fare. All you need is a valid AllCampus Card to travel to your favorite Raleigh or Triangle area destinations.

Bicycles/Walking
Bicycling is also an inexpensive, healthy and environmentally-friendly way to travel to, from and around campus. Bike racks are conveniently located throughout our three campuses. Students are encouraged to register their bicycles on-line at the website above or at Campus Police and Transportation Offices. For more information on bicycling and walking on campus (including a WalkTimes map), please visit WolfTrails at www.ncsu.edu/transportation.

Transportation is located in Administrative Services I, 2721 Sullivan Drive, (919) 515-3424.

STUDENT ACTIVITIES

The university makes every effort to provide surroundings that are pleasant and conducive to intellectual and personal growth. In addition, a wide variety of athletic, cultural and social opportunities are available to students. Through the services and activities affiliated with campus life, as well as through extracurricular organizations and functions, students at NC State may acquire experience in group leadership and community living to supplement and enrich their education.

Student Government

Every NC State student is a member of a community that exercises executive, legislative and judicial authority in matters of student life. Students have a voice in government through participation in campus-wide elections of officers and legislators and may apply to serve in the judicial branch.

Clubs and Societies

Honorary. University-wide honorary societies include Golden Chain, senior leadership; Thirty and Three, junior leadership; Phi Eta Sigma and Alpha Lambda Delta, freshman scholarship; Gamma Beta Phi, scholarship and service; and Phi Beta Kappa and Phi Kappa Phi, junior, senior and graduate student scholarship.

Professional and Technical Organizations. The colleges and departments sponsor or supervise a large number of professional and technical societies and clubs. These organizations contribute substantially to the students' professional and social growth.

Greek Life (Fraternities and Sororities). There are over 40 Greek letter organizations at NC State University, and four pillars guide each: Leadership, Scholarship, Service, and Sisterhood/Brotherhood. While the fraternal values of each organization are similar at the core, each organization expresses itself through its unique membership. At State, we have social fraternities and sororities, historically African-American and Multicultural Greek letter organizations, and fraternities and sororities that recruit by academic focus or common interest.

Regardless of affiliation, being Greek means more that just wearing Greek letters, attending meetings, and participating in social events. Being in a fraternity or sorority is about making friendships that will last far beyond your college years while enhancing your personal development by committing to ideals of scholarship, leadership, and service. It is being respected for your individuality while being part of a brotherhood or sisterhood with individuals who share the same goals and values. Your brothers or sisters are there to support you, making your transition to college easy and fun.

Membership is a solemn commitment. Joining a fraternity or sorority means a lifelong dedication to the ideals and principals of Greek life. Greek men and women are successful in life because they put into action the values they learn during the undergraduate years of affiliation.

For more information on membership, educational programming or service opportunities, visit the Department of Greek Life's website at www.ncsu.edu/greek_life, the office in 1104 Pullen Hall, or call (919) 513-2910.

Pershing Rifles. This is a professional and social fraternity open to students enrolled in any ROTC courses. Members of the Pershing Rifles participate in ceremonies such as the Color Guard for NC State athletic events and Pennant Guard for home football games. Pledge period is one semester, and focuses on the history and traditions of the Pershing Rifles, as well as technical ability in the mastery of drill and ceremonies.

The Ranger Challenge Team. Open to all members of the Wolfpack Battalion. Members participate in intercollegiate competitions of military skills, including rifle marksmanship, hand grenades, ruck marching, patrolling, weapons assembly, the APFT, and rope bridge construction. NC State's Ranger Challenge Team is consistently one for the best on the east coast. Sponsored by Army ROTC, it competes against other schools in North and South Carolina, as well as schools on the east coast.

Other Organizations. There are over 300 other student organizations. Student activities and organizations exist because they play a key role in your success and enjoyment of your experience at NC State. Student organizations are where you will meet new people and develop friendships, contribute to your community and make a difference, explore career opportunities and gain experience, learn and practice leadership skills, and have a lot of fun! They help add balance to your life, in addition to helping you to become aware of different cultures and lifestyles, and developing an appreciation for the arts. Students interested in exploring these organizations or in creating a new organization, may contact the Student Organizations Resources Center, Box 7306, Room 1202 Talley Student Center, (919) 515-3323; www.ncsu.edu/sorc.

Student Media

NC State students have the opportunity to produce and manage a variety of student-oriented media. By working with these media, students gain valuable cocurricular experience in journalism, broadcasting, production, design, leadership and management. There are six media staffed by students and supported in large part by non-academic fees. Many staff positions are paid.

Agromeck, the university's fall-delivery yearbook, provides a record in words and pictures of student and campus activities during the past year. Student staff members include photojournalists, writers, designers and editors, all with a common mission— to document the history of the university. The Agromeck has received some of the nation's highest awards for general excellence and photography and a national Pacemaker and Crown award. The Agromeck staff also publishes the new student directory each fall. website: www.ncsu.edu/agromeck

Americana, the university's online journal, features art, essays, poetry and editorials about a wide variety of topics. website: americana.ncsu.edu

Nubian Message provides news and features about the African-American community at NC State. website: www.ncsu.edu/nubian

Technician, the university's oldest student newspaper, is published daily when school is in session during the fall and spring semesters and weekly during the summer. With a circulation of more than 11,000 and an online circulation of 4,000 daily, the broadsheet newspaper, funded almost solely through advertising income generated by a student business staff, has received numerous awards for design and photography. The Technician has been recognized nationally with a CSPA Crown award and numerous national awards for design and photography. website: www.technicianonline.com

The Windhover, the campus literary and visual arts magazine, is published each spring. It has received numerous national awards, including the Pacemaker from the Associated Collegiate Press. website: www.ncsu.edu/windhover

WKNC (88.1 FM), the student radio station, operates at 25,000 watts and streams online enabling it to be heard all over most of Central North Carolina as well as around the world. The station operates 24 hours a day, using state-of-the-art computers and audio

technology with a staff of engineers, disc jockeys and news personnel. The radio station staff also sponsors a concert series and Open Mic Night. website: www.wknc.org

The Student Media Board of Directors is a way for students to get involved in the management of a large business operation with a budget of about $1 million. The Board of Directors is the governing arm for all the media that use student fee monies. Elections to the Board are held in the spring. The Student Media also hires other students to sell ads and sponsorships. website: www.ncsu.edu/sma.

Center for Student Leadership, Ethics, and Public Service

The center's mission is to provide unique learning experiences that embody the value of leadership, service, responsible citizenship, and ethics for students who aspire to be principled, innovative, and socially conscious contributors to a caring and civil society.

The center offers the Leadership Development Series (LDS), which consists of over 40 non-credit workshops that focus on different aspects of leadership. Students have the opportunity to earn a Visionary Leaders Certificate and a Leadership Transcript, a dynamic resume supplement that informs employers and graduate admissions officers of a commitment to developing personal leadership skills. Students can also participate in The Emerging Leaders Program, a 9-week leadership seminar and The LeaderShape Institute - a six-day leadership development experience designed to help participants learn to "lead with integrity" and work towards developing visions for positive change.

Students can participate in domestic and international Alternative Fall, Winter and Spring Break Service-Learning trips that challenge them to help those in need while relating what they have learned in the classroom to the outside world. Students may also participate in one-time service through announced volunteerism projects as well as on-going service with one of many student service organizations on campus. Also, a comprehensive list of over 150 service opportunities is available on our website.

We encourage students to become Service-Leadership Consultants (SLCs) who are trained to provide dynamic leadership development and training experiences to individuals and organizations as well as serve as ambassadors for the center.

Each year the Role Model Leaders' Forum honors an outstanding regional, national, or international leader who inspires us with their personal view of leadership and the challenges today's ethical leaders encounter. The Leadership Library contains over 300 leadership reference materials available for checkout (books, audio cassettes, videotapes, and newsletters). A complete listing is available online at www.ncsu.edu/csleps.

For further information and a complete listing of our offerings, please stop by 3115 Talley Student Center, (919) 515-9248 or visit www.ncsu.edu/csleps

Department of Campus Activities

The Department of Campus Activities includes the Union Activities Board and Campus Cinema, Parents & Families Services, Student Handbook, WolfCamp, and the Student Organization Resource Center (SORC).

The **Union Activities Board (UAB)** is a student-directed programming network of four committees that plan and implement a variety of programs for the campus community, including the Films Committee (that schedules films for Campus Cinema), Leisure & Entertainment Committee, Issues and Ideas Committee, and the Diversity Committee, which has two subcommittees: the Black Students Board and the International Activities Council.

Parents and Families Services provides resources and programming for families of NC State students including Parents' Orientation, Parents and Families Weekend, Pack Parents newsletters, Live with NC State webcasts on topics of interest and the Parents' Helpline.

The **Student Organization Resource Center (SORC)** provides registration and support for over 400 registered student organizations, including mailboxes, meeting space, equipment rental, and free photocopying as well as permits for solicitation and public gatherings.

Multicultural Student Affairs

The Department of Multicultural Student Affairs (MSA) researches, designs and implements unique programs that promote the pursuit of academic success, retention and graduation of students, with an emphasis on African American, Native American and Hispanic students. Many of the programs and services expand students' cultural horizons while honoring their respective cultural experiences. Multicultural Student Affairs works in conjunction with a number of university departments and colleges to conduct programs related to recruitment, orientation, retention and graduation in addition to academic, personal, professional and cultural development, which foster skills and strategies for being successful at NC State. Some of the programs and services include the following: African American Symposium, Native American Symposium, Peer Mentor Program, Hispanic/Latino Heritage Month Programming, Native American Heritage Month, SABA- Academic Enrichment Program, Kwanzaa Celebration, Freshman Honors Convocation, annual POW WOW, Student Leadership Development and Student Organization Advising. Target populations for Multicultural Student Affairs are determined by differences in retention and graduation rates for historically underrepresented groups as well as anticipated demographic shifts regionally and nationally. Any NC State student can access programs and services through Multicultural Student Affairs. For further information and a complete listing of our offerings, please stop by 1107 Pullen Hall, call (919) 515-3835 or visit www.ncsu.edu/msa.

The Women's Center

Celebrating women 365 days a year through support, empowerment, education, and leadership development, the NC State Women's Center challenges and motivates the hearts and minds of both women and men to achieve inclusivity and gender equity. The Women's Center strives to create a safe and celebrative space for women to explore, learn, and reach their maximum potential in a more equitable society. Open to students, staff, and faculty, programs reflect a wide range of viewpoints about women's issues and gender equity. They are designed to increase understanding of gender issues, empower women to explore options in their lives, and motivate both women and men toward greater involvement in these issues. Through programs that address matters from body image and safety to developing leadership skills, the Women's Center enhances the quality of life and learning for students in the NC State community.

Known for a warm and welcoming atmosphere, the Women's Center is open to everyone and provides a supportive environment for individuals and groups. Informal advising and consulting on advocacy issues for women as well as referrals to campus and community resources are among the services offered by the Women's Center. In addition, the Women's Center provides confidential assistance, information and referrals for sexual harassment, sexual assault, and domestic/relationship violence.

The Women's Center manages the Molly Hays Glander Rape and Sexual Assault Response Line. This 24-hour hotline can be reached at (919) 618-RAPE (7273) and serves as a resource for NC State students. The Advocates are trained volunteers who offer confidentiality, crisis information support, and provide resources and referrals for survivors of rape and sexual assault. The Women's Center also provides these services based on staff availability during normal business hours as well as a safe space to hang out between classes. Our lending library has a selection of books that may be helpful for survivors and their supporters during the healing process. Programs such as Take Back the Night help give voice to the violence while also educating the campus.

The NC State Women's Center provides resources for women and men at a time when gender roles are changing within the NC State University community and society at large. Emphasis is placed on empowering women as leaders and agents of change on campus and beyond. Specific programs, services, and student groups are designed to provide students with peer support, leadership experiences, and positive role modeling. Such opportunities create support networks for female students (many of whom are pursuing careers in fields not traditionally open to women), promote personal growth, and encourage a positive gender identity.

Housed administratively in the Division of Student Affairs, the NC State Women's Center is located in 3120 Talley Student Center. For more information about our programs and services, please stop by our office, visit our website at www.ncsu.edu/womens_center or call us at (919) 515-2012.

Facilities

Carmichael Complex includes a wide variety of indoor and outdoor fitness choices for students. Students may use the pools, indoor track, courts, cardio equipment, the outdoor fields, and tennis courts. Campus Recreation and the Department of Physical Education are housed in Carmichael Complex. For more information, please visit our website www.ncsu.edu/carmichael or call (919) 515-PLAY (7529).

Price Music Center is the location for the Music Department and its programs.

Talley Student Center is the location for a variety of facilities, programs, and services designed to offer rest, relaxation and recreation, as well as cultural, social, leadership and artistic development. Facilities in the Talley Student Center building include Stewart Theatre, the Gregg Museum of Art & Design, several lounge areas, the Wolves' Den Game Room, and a variety of dining opportunities, including the Wolves' Den, Commons Cafe and the Emporium Convenience Store. The Talley Student Center has 18 meeting and activity rooms, which are available for reservation to all campus organizations, with access to catering and audio-visual services. The Talley Student Center also offers Flyspace, located in the Talley Student Center Wolves' Den, which is a new student collaborative labspace available for reservation in advance to any student with a Unity ID. To reserve fly-space or another room in Talley Student Center, see www.ncsu.edu/student_center.

Program offices include Arts Development; Campus Activities; Center Stage Performing Arts Series; Center for Student Leadership, Ethics & Public Service; Chaplains' Cooperative Ministry; Dance Program; Gregg Museum of Art & Design; National Student Exchange Program; Parents & Family Services; Student Legal Services; Student Organization Resource Center (SORC); Union Activities Board; University Theatre; and the Women's Center. Service areas include Reservations and Events Management offices, Information Center, Ticket Central, and University Dining administrative and catering offices.

Thompson Building is the location for University Theatre and The Crafts Center. Renovation plans are underway for a complete remodeling of the entire facility transforming it into a "state-of-the-art" performance and production space open to all students. The building houses University Theatre's full production activities, performance, and classes. Facilities include the Main Stage theatre, the Titmus Studio Theatre, the Costume Shop, the Scenic Construction and Paint Shop, Lighting and Sound facilities, and rehearsal and classroom spaces.

The Crafts Center is located in the lower level of the Thompson Building. The Crafts Center is an extraordinary educational facility that functions as an art school specializing in crafts. Considered to be one of the finest on any university campus, The Crafts Center has served NCSU students, employees, and the surrounding community for over four decades! The Crafts Center provides a friendly and informal atmosphere for both learning and creating. Students can participate in any of more than 40 classes offered each semester in art, pottery, photography, fibers, woodworking, glass, lapidary, jewelry making, and more. The Crafts Center is funded entirely by NC State University students and community participation.

Witherspoon Student Center (WSC) houses the African-American Cultural Center, Student Government Offices, the Media Authority and offices of six student-run media organizations - Americana (online journal), Agromeck (yearbook), The Nubian Message and Technician (newspapers), Windhover (literary magazine), and WKNC FM 88.1 (radio station). The WSC also includes several lounge areas, including two balconies; one meeting room available by reservation; the African-American Cultural Center's Multi-Purpose Room, Gallery and Library; and the Campus Cinema, used for films, lectures, and special events.

ARTS NC STATE

The six visual and performing arts programs of ARTS NC STATE - Center Stage, the Crafts Center, the Dance Program, the Gregg Museum of Art & Design, the Music Department and University Theatre - provide opportunities for our students and our community to explore, learn, create, and grow. Whether through academic courses, cutting-edge performances or the preservation of traditional crafts, ARTS NC STATE educates our students for the 21st century while providing a living link to our rich cultural heritage. Renovation plans are underway for a complete remodeling of the entire Thompson facility, which houses two arts programs, transforming it into a "state-of-the-art" performance and production space open to all students. Until renovations are complete, the Crafts Center and University Theatre will offer classes and productions at alternative locations. For additional information, please visit the following website: www.ncsu.edu/arts.

ARTS
NCSTATE

Center Stage Performing Arts Series
Experience live, world-class performances at Center Stage, NC State's professional performing arts series. Most shows take place in Stewart Theatre, located inside the Talley Student Center. A typical Center Stage season features outstanding artists from a wide range of disciplines, including jazz, world music, modern dance, drama and comedy. Discounted tickets are available to NC State students, faculty, and staff, as well as parents of current NC State students and members of the NCSU Alumni Association. Contact: (919) 513-3030 or www.ncsu.edu/centerstage

The Crafts Center
The Crafts Center is an extraordinary 20,000+ square foot educational facility. Considered to be one of the finest on any university campus, The Crafts Center has served students and the community for over four decades. Students can participate in any of more than 100 classes offered annually in art, pottery, photography, fibers, woodworking, glass, lapidary, jewelry making and more. Classes, weekend workshops, and short courses are offered at all levels for the beginning student as well as the accomplished artist. Work side by side with other students, staff, faculty, and community artists and gain inspiration while utilizing studio space in wood, clay, glass, metals/jewelry, lapidary, optics, photography or weaving. Everyone is invited to become a member of this supportive artists' community. The atmosphere is relaxed and welcoming, providing a great place to meet people, to share new experiences and to learn about the creative process. Contact: (919) 515-2457 or www.ncsu.edu/crafts.

Dance Program
The NC State Dance Program offers opportunities in performance through two student companies: the NCSU Dance Company and DanceVisions. The NCSU Dance Company, a nationally recognized college modern dance company, and DanceVisions, whose repertoire ranges from modern to hip hop, are both open by audition, present annual spring concerts, and perform in many other venues on and off campus throughout the year. The Dance Program presents the Fall Concert, an annual formal concert that showcases choreography by NC State students, alumni, and other guests. The Dance Program also sponsors the Professional Projects Program, offers master classes and special programs, and works cooperatively with the NC State Department of Physical Education in offering academic classes in dance. Contact: (919) 515-7034 or danceprogram@ncsu.edu or www. ncsu.edu/dance.

Gregg Museum of Art & Design
The Gregg Museum of Art & Design is NC State's museum and houses its growing collection of contemporary and historical examples of ceramics, textiles, glass, furniture, photography, folk and outsider art, and works on paper by artists from every continent. The collection provides the context and inspiration for an annual series of changing exhibitions of regional, national and international significance. The collection, exhibitions and associated interpretative programs give the NC State community and the state unique access to work in these media.

The museum is located on the second floor of the Talley Student Center (2610 Cates Avenue). Exhibitions in the Foundations and Cannon Galleries are free and open to the public. The collection database is accessible through the museum website. Student internships for course credit are offered each semester. Faculty, student groups and the public may schedule tours or arrange visits to the permanent collection by calling the museum's administrative offices. Contact: (919) 515-3503 or gad.ncsu.edu.

Music Department
The Music Department offers both performing ensembles and academic courses for the music minor program and elective credit. Academic courses include the history and theory of Western art music, special topics such as Women in Music and Introduction to African American Music, and introductory music appreciation courses. For full descriptions of the academic courses, consult the NC State University Course Catalog. (Also see Music Department, pg 192) Contact (919) 515-2981 or www.ncsu.edu/music.

- **Performing Ensembles.** A wide variety of performing ensembles provide opportunities for participants to develop artistically and intellectually through applied music. Through performance, the ensembles play an important part in campus life, presenting public concerts and performing at official functions and athletic events. Music ensembles receive one academic credit that may be used to satisfy free elective requirements in any academic major. Membership in all ensembles requires an audition with the instructor.
- **Choral Ensembles.** The Choral program offers students from all academic areas an opportunity to participate in the exploration and performance of the highest quality of choral repertoire spanning five centuries. The ensembles include Chamber Singers,

Concert Choir, University Singers, and The New Horizons Choir. Performance highlights have included concert tours of the Eastern United States as well as fall and spring concerts both on and off campus.

- **NC State Pipes and Drums.** Students may play the bagpipes, an instrument known to many of North Carolina's earliest settlers, in order to represent the university through this unique and distinctive medium. Pipes, drums, and other equipment are furnished. Beginning pipe and drum lessons are available to students without previous experience.
- **Orchestras.** The Raleigh Civic Symphony and Chamber Orchestra combine student and community musicians with professional leaders, presenting concerts of innovative programming on campus and in other Triangle Area venues. Area professionals serve as concertmaster, principal cellist, and guest coaches, providing high-level instruction and leadership to community and student players. Both orchestras are on the same artistic level and require an audition with the conductor.
- **Wind Ensembles.** The wind program includes the Wind Ensemble, British Brass Band, Jazz Ensembles, Marching Band and Pep Band. The Marching Band is active during football season and the Pep Bands are active during basketball season. Other bands and ensembles usually meet both semesters. Placement in a band or ensemble is made according to student ability and interest.
- **Piano.** Beginning piano classes are offered to students from all academic areas for credit. No previous experience is required. Honors sections of class piano are available for beginning piano students who are music minors, or who qualify by departmental approval. Private lessons are offered to advanced piano students who have passed an audition and are admitted to the music minor program in piano performance.
- **Voice.** Vocal Techniques class is offered to beginning voice students for credit with instructor approval. Previous voice study is not required. Private voice lessons are offered to advanced voice students who have passed an audition and are admitted to the music minor program in vocal performance.

University Theatre

University Theatre is the university's volunteer student theatre, housed within the Division of Student Affairs. Each season, in our five main-stage shows, summer Theatrefest, Madrigal Dinner, and other special productions, the sold-out audiences see on stage the result of hours of work, weeks of exploration, and months of preparation. Guided by a professional staff, students on stage and behind stage present shows that garner the highest praise from loyal audiences and enthusiastic reviewers. University Theatre offers a blend of student volunteer productions and academic theatre training. Productions are open to all NC State students, whether or not they are enrolled in theatre courses. Classes are available in acting, directing, introduction to theatre, and all areas of technical theatre, including stagecraft, costume, make-up, lighting, and scenic design. Students may receive a theatre minor through the Communication Department or a Bachelor of Arts degree with a focus in theatre through the Arts Studies Program in the College of Humanities and Social Sciences. Student theatre organizations, open to all NC State students, include Alpha Psi Omega and Black Repertory Theatre. Contact: (919) 515-2405, 515-3927 or www. ncsu.edu/theatre.

Ticket Central

Ticket Central serves as the centralized box office for the ARTS NC STATE Visual and Performing Arts programs. Ticket Central tickets events in a variety of performance venues including Stewart Theatre, Thompson Theatre, the Talley Student Center, and Witherspoon Student Center.

In addition to serving the six arts programs of ARTS NC STATE, Ticket Central provides ticketing services on a fee basis for many campus and non-campus events. The box office is located on the second floor of the Talley Student Center. Normal hours of operation are Monday-Friday 10-6 p.m. If there are performances during the week, the box office will remain open until thirty minutes after curtain. On weekends with performances, the box office will open one and a half hours prior to curtain. Hours vary during university holidays and during the summer. Tickets may be purchased in person, by telephone by calling (919) 515-1100, or online by visiting our website at www.ncsu.edu/arts.

Intercollegiate Athletics - Go Pack!

The university's "Wolfpack" athletic teams are nationally recognized and enjoy a tradition of excellence as they compete in the prestigious Atlantic Coast Conference. The men's basketball team won national championships in 1974 and in 1983 and holds 10 ACC titles. The Pack, under first-year head coach Sidney Lowe, notched its fourth straight 20-win season last year and appeared in the ACC Championship game for the third time in the past five years. The football begins a new and exciting era this fall with head coach Tom O'Brien taking over a storied program that has been the Atlantic Coast Conference champion five times, co-champion twice, and has played in 23 bowl games, including five in the past eight years.

The Wolfpack women's cross country team won national championships in 1979 and 1980 along with 21 ACC crowns, while the men's cross country team has won the ACC title 14 times. The women's basketball team, led by 1988 United States Olympic gold medal-winning and Naismith Hall of Fame coach Kay Yow, advanced to the NCAA "Sweet 16" for the 11th time last season. The program reached the NCAA "Final Four" in 1998. Yow has over 700 career wins.

The men's and women's soccer teams have both advanced to the NCAA's "Final Four," the women in 1988 and 1989, and the men in 1990, while the wrestling team has won it's 14th ACC title last season. The cheerleading squad has been recognized three times as national champions and Ms. Wuf was named the top collegiate mascot in the country last spring. NC State student-athletes have won numerous conference, NCAA and All-America athletic and academic honors, including medals in six Olympic Games.

The Department of Athletics conducts the university's intercollegiate athletics program, which includes 23 varsity sports, 12 men's, 11 women's. The athletics program is administered by the Athletics Director, Lee Fowler. The Council on Athletics is appointed by the Chancellor and serves in an advisory capacity to the Director of Athletics and the Chancellor.

The athletics program is self-supporting and is operated primarily through gate receipts, radio and television revenues, NCAA distributions, and student fees. Funds for athletics grants-in-aid are provided through the North Carolina State Student Aid Association (Wolfpack Club).

Men's varsity sports include soccer, cross country, and football in the fall; basketball, swimming, indoor track, and wrestling in the winter; and outdoor track, golf, tennis, and baseball in the spring. Varsity sports for women include soccer, cross country, and volleyball in the fall; basketball, indoor track, swimming, and gymnastics in the winter; and track, golf, softball and tennis in the spring. The co-ed rifle team competes during the winter.

A $100+ million facilities development plan is now nearing completion. Carter-Finley Football Stadium's permanent seating has been increased to 55,600 while the state-of-the art 106,000-square-foot Murphy Football Center was completed in 2003. Vaughn Towers, a 117,000 square-foot structure along the west grandstand of the stadium, opened for the 2005 season and houses 955 Club-level seats, 51 private luxury suites, a University Suite for the Chancellor, and a state-of-the-art press box that seats up to 112 members of the media. The final phase of the Carter-Finley Stadium renovations, the enclosure of the north end zone, was completed prior to the beginning of the 2006 campaign.

The men's basketball team plays in the RBC Center, which seats 19,700. Reynolds Coliseum (9,500) is used for women's basketball, wrestling, women's gymnastics and volleyball competition.

A $5 million renovation of Doak Baseball Field (2,500) was completed in June 2004 as well as construction of a new Wolfpack Tennis Complex with four indoor courts. Paul Derr Track Stadium (3,000) is being redesigned to accommodate men's and women's soccer and an adjacent women's softball complex.

The Case Athletics Center has been converted to house Academic Support Services for Student-Athletes. Wolfpack athletics administrative offices and coaches' offices are primarily housed in the Weisiger Brown General Athletics Facility with coaches offices also located in Reynolds Coliseum, the Murphy Football Center, the Wolfpack Tennis Complex and Doak Field.

The fundraising offices of the Wolfpack Club and the athletic department marketing and ticket offices are located near Carter-Finley Stadium at 5400 Trinity Rd. (Suite 500), Raleigh, NC 27607. For ticket information call (919) 865-1510 or 1-800-310-Pack. The main athletic department receptionist: (919) 515-2101. Visit the official athletic department website for complete information: gopack.com.

ACADEMIC POLICIES AND PROCEDURES

Note: NC State University policies, rules and regulations are continuously being updated and reviewed as the need arises. For the most current information regarding this section, please visit the Policies, Rules, and Regulations website at www.ncsu.edu/policies/homepage.php.

Academic Advising

Most regularly enrolled students are assigned for academic advising to a faculty member who is normally a member of the department, which is, or is most likely to become, the student's major department. Students who are admitted into programs such as the First Year College, the Transition Program, etc. will be advised by professional advisers in those programs who will aid the students in the process of selecting an appropriate major.

Responsibilities of the Student
Students have the primary responsibility for planning their individual programs and meeting graduation requirements. This involves keeping up-to-date with university, college, and department curricular requirements through materials available from the advisers or departmental coordinators of advising; keeping informed of academic deadlines and changes in academic policies; and consulting with the adviser or departmental coordinator of advising during each registration period, following notification of academic warning status, and at other times as needed and required by academic policy; and diligence in attending class and meeting class objectives and assignments.

Responsibilities of the Adviser
Although students have the primary responsibility for planning their programs, advisers are expected to: be available for conferences at appropriate times and places about which their advisees have been informed; provide accurate information about academic regulations and procedures, course prerequisites, and graduation requirements; assist students in planning academic programs suited to their interests and abilities and their career objectives; discuss with their advisees appropriate course choices in fulfilling curriculum requirements as well as possible consequences of various alternative course choices; inform their advisees when the advisee's proposed course selections conflict with university academic or curricular regulations; assist advisees with following proper procedures for such things as Progress Toward Degree, exceptions to the course drop deadlines, auditing a course before or after taking it for credit, taking a course under the credit by examination policy, registering for 19 or more credit hours, registering for interinstitutional courses, or repeating a course previously passed; refer their advisees for special testing or counseling as needed; assist their advisees in considering the appropriateness of academic adjustments where these become necessary in cases of serious injury or illness.

Responsibilities of the Coordinator of Advising
Each college or department has a coordinator of advising and teaching who is responsible for: assigning, training, and supervising faculty and professional advisers; providing up-to-date, printed course and curriculum information for advisers and students; reassigning to another adviser any student who so requests, assisting any student who wants to major in the coordinator's area of study but is ineligible at the time to transfer into it. Students in this category keep their adviser in the department in which they are enrolled, but consult additionally with the coordinator of advising and teaching for the department offering the curriculum in which they wish to enroll. Whenever appropriate, the coordinator will advise students that they should consider alternative curricula.

Progress Toward Degree

The objective of NC State University's Progress Toward Degree Regulation is to encourage timely matriculation into a degree program and reasonable progress toward graduation. This regulation applies to all NC State undergraduate degree-seeking students who entered as first time freshmen or transfer students beginning fall semester 2002. All NC State undergraduate students regardless of date of entry are subject to the regulation.

Each student in consultation with their adviser will develop a plan of study that serves as a planning tool for completing degree requirements for the major(s) in which the student is matriculated. Students in the First Year College and other undeclared or undesignated programs will develop a plan of study for the major(s) in which the student expects to matriculate. The Plan of Study can include plans for tailoring the academic majors, minors, and other specialized academic opportunities.

Enrollment in course work should be consistent with the student's Plan of Study. The Plan requires a minimum enrollment of 12 credit hours during consecutive semesters until graduation, and the successful completion of at least 24 credit hours of planned NC State or transferable course work each academic year, unless otherwise justified by an approved Plan of Study. All students must be in or matriculate into a degree program by the beginning of classes in the first semester that the student has junior status (i.e. 60 credit hours earned - criteria established in Classification of Undergraduate Students regulation).

In order to meet the requirements for satisfactory progress toward degree completion, a full-time undergraduate student classified as a freshman must:

- by the end of the first year of enrollment (including summer sessions), have on file a registered Plan of Study that serves as a planning tool for completing degree requirements for the major(s) in which the students is matriculated, or expects to matriculate or transfer, and
- successfully earn at least 24 credits of NC State or transferable course credit that is included in the approved Plan of Study each academic year.

Comparable requirements exist for students in their sophomore, junior, and senior years. Students who enter NC State as part-time students or transfer students are also required to develop a Plan of Work in cooperation with their adviser.

Students who fail to meet the requirements for Progress Toward Degree will be placed on Progress Warning Status and will have one semester to work with their adviser to develop a specific plan of action that restores "satisfactory progress" status in their current major or to transfer or matriculate into an alternative major. Students who fail to meet the requirements for satisfactory progress toward degree after one semester on Progress Warning status will not be permitted to enroll as an undergraduate degree-seeking student. Such students will be required to apply through the readmission process if they wish to return to degree seeking status.

For complete details and explanation of the Progress Toward Degree Regulation see the following website: www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.20.php.

Graduation Requirements

Students are eligible for graduation when they have completed satisfactorily all the academic requirements of their degree program as specified by their major department, their college, and the university.

NC State requires that, in addition to other university, college, and departmental requirements, all students must have a grade point average of at least 2.000, based on all courses attempted at NC State, in order to be eligible to receive a baccalaureate degree.

Minimum Hours Required for Graduation
Minimum credit hours required in a baccalaureate curriculum that has not been designated a five-year program range from 120 to 128. These are shown for each curriculum. Students may take more hours than the required minimum.

Length of Time to Graduation
The normal and expected length of time to graduation is four years (eight semesters) provided the student completes an average of slightly more than 16 credit hours each semester (for most curricula) or attends one or more summer sessions.

By action of the N.C. General Assembly, effective with the 1994 Fall Semester, new students entering any of the sixteen campuses of the University of North Carolina system (including NC State), will be assessed a 25 percent tuition surcharge once they have attempted more than 140 degree credit hours. (Degree programs at NC State require 128 hours or less for graduation.) Courses taken in summer school at any UNC-System campus do not count towards the 140-hour limitation. Questions about this policy should be directed to the Department of Registration and Records, (919) 515-2572.

In order to make continuous progress toward graduation, students are encouraged to take full advantage of the university's advising and support services. Effective career decision-making and early, deliberate, long-range semester-by-semester planning of courses and careful selection of extra-curricular commitments can provide direction and motivation necessary for effective use of time towards graduation.

Additional factors that may assure a student's continuous progress toward graduation include good academic performance in freshman and basic prerequisite courses, advanced placement for introductory courses, and enrollment in summer sessions. Students are discouraged from taking unrealistic course loads as a means to accelerate their progress toward graduation as this may result in poor academic performance.

Students may take more than eight semesters to complete an undergraduate program at NC State. In some cases this is the result of effective decision-making on the part of the student for such things as participation in cooperative education or study abroad programs; a decision to be a part-time student with a reduced course load for reasons of health, necessary outside employment, or parental responsibilities; or attempting dual degrees, double majors, or academic minors.

In other cases the length of time to graduation may be prolonged beyond the eighth semester as a result of incomplete or inadequate secondary school background requiring some additional compensatory, developmental, or prerequisite courses. Poor academic performance in the freshman year or early semesters, or late changes in curriculum could also impact time to graduation.

Semester-by-Semester Displays
The requirements for many curricula throughout this section are set forth in semester-by-semester displays. One purpose for these displays is to illustrate how certain sequences of courses and prerequisites may be scheduled. Another purpose is to reflect whether courses are normally offered in the fall or the spring semester. Otherwise, the semester-by-semester displays are merely advisory and not mandatory. The typical semester schedule shown in the displays may not be the appropriate one for many students. Students are required to consult with their faculty advisers prior to registration each semester. Semester-by-semester displays are available online: www.ncsu.edu/registrar/curricula.

Limited D Grades
Some colleges and departments have established limitations on the use of D grades in certain courses or categories of courses for satisfying graduation requirements.

Grade Point Average in Major
Some departments have established graduation requirements of a grade point average of 2.000 on all courses attempted in the major at NC State or a "C-" or better in some or all major courses. Such a requirement is in addition to the university grade point average requirement of 2.000 for all courses attempted at NC State. Students are encouraged to inquire about specific requirements in majors of interest.

Residence Requirements
To be eligible for a bachelor's degree, a student must be enrolled in a degree program at NC State, must have completed at least 25 percent of credit hours required for graduation through courses offered by NC State, and must have earned at least 30 of the last 45 hours of credit through NC State courses. In no case shall the proportion of credit hours taken at NC State and applied towards a bachelor's degree be less than 25 percent. Individual departments and/or colleges may have additional residence requirements. Be sure to ask your adviser about any special requirements.

Note: The College of Engineering has a policy that transfer students normally must earn at least 48 of their last 60 hours of credit at NC State while enrolled as degree candidates. The College of Management has a policy that Accounting and Business Management majors normally must earn at least 30 credit hours while officially enrolled as a degree candidate in either the ACC or BUS curriculum. Students in the Economics majors (EC/ECS) must earn at least 1/2 of their required economic credits while enrolled in the EC or ECS curriculum.

Free Electives

All schools and colleges are encouraged to include free electives in their curricula to satisfy their educational objectives. Moreover, students who would like to take courses beyond those required for their degree are encouraged to do so.

Classification of Students

Undergraduate degree students are classified according to the number of completed credit hours. The required number of hours of each classification is:

Classification	Semester Hours of Earned Credit
Freshman (FR)	Fewer than 30
Sophomore (SO)	30 or more, but fewer than 60
Junior (JR)	60 or more, but fewer than 92
Senior (SR)	92 or more

Agricultural Institute students are designated as first (01) year if they have earned fewer than 30 semester credits and second (02) year if they have earned 30 or more semester credits.

Unclassified Students (UN) are those working for college credit but not enrolled in a degree-granting program. Admission as an unclassified student requires the recommendation of the dean of the school in which the student wishes to enroll. Unclassified students must meet the same entrance requirements as regular degree students and must meet the same academic requirements to continue. If, at a later date, unclassified students wish to change to regular degree status, their credits will be evaluated in terms of the requirements of their intended curriculum.

The Special Student (SP) classification includes Undergraduate Studies **(UGS)** and Post-Baccalaureate Studies **(PBS)** students:

Undergraduate Studies (UGS) students are United States citizens who have not obtained a baccalaureate degree and who take courses but who are not currently admitted to a degree program. To be eligible to register as a UGS student, a person should either: (a) have acquired a high school diploma or a GED certificate; not have been suspended from any college or university (including NC State) within the last three years; and not be a degree candidate at NC State; or (b) be a high school student who has been recommended by his/her school and approved by Credit Programs to take lower level courses. Visiting summer sessions students and visiting international students do not necessarily have to meet the above criteria.

Post Baccalaureate Studies (PBS) students are United States citizens who take courses beyond the baccalaureate degree but who are not currently admitted to a degree program. This classification is closed to international students with the following exceptions: (a) spouses of regularly enrolled NC State degree students; or (b) students enrolled in special programs such as AID or FAO who are approved in advance by the International Student Office and the Graduate School.

All **UGS** and **PBS** students must register through Registration and Records, located in 1000 Harris Hall. *Persons found eligible to study as UGS or PBS students are not to assume that they have received formal admission to the university as either undergraduate or graduate degree candidates.* To become a degree candidate, formal application must be made through the Undergraduate Admissions Office or the Graduate School. The maximum course load for all UGS and PBS students is two courses plus one physical education course each semester or summer session. They may enroll in any course offered by the university, provided they have satisfied any required prerequisites and space is available. The academic standards applicable to undergraduate degree candidates at the university, including the Continuation of Undergraduate Enrollment Policy, apply to UGS and PBS students.

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.6.php

Course Load

The maximum course load for undergraduate degree students is 21 credit hours a semester and two courses plus a physical education course in a summer session. Undergraduate students who wish to register for more than 18 hours during the fall or spring semester must have their adviser complete this Course Load Waiver Form and return it to Registration and Records. Students who wish to

register for more than 21 hours during the fall or spring semester must complete a Schedule Revision Form. Schedule Revision Forms are available from the student's departmental office. First semester freshmen with admissions indices less than 2.000 and continuing students with a grade point average less than 2.000 should be advised to carry no more than 16 credit hours in a semester.

For Undergraduate Students (UGS) and Post-Baccalaureate Studies (PBS) students the maximum course load is two courses plus a physical education in a regular semester or summer session. The minimum course load for full-time undergraduate degree students is 12 credit hours, except in their final semester when a lesser number may be taken if that is all the student needs to fulfill the requirements for a degree. In order to receive financial aid a student must meet the minimum course load requirements of the appropriate funding agency. The number of hours for which a student is officially enrolled is that number in which the student is enrolled for credit at the end of the second week of classes (i.e., the last day to withdraw or drop a course with a refund).

For the most current information regarding this regulation, please visit the following websites:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.8.php
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.6.php

Grading Scale and Grade Points

Grade	Definition	Grade Points per Credit Hour
A+		4.333
A	Excellent	4.000
A-		3.677
B+		3.333
B	Good	3.000
B-		2.677
C		2.333
C	Satisfactory ("Passing" for graduate students)	2.000
C-		1.677
D+		1.333
D	Marginal	1.000
D-		0.677
F	Failing	0.000

A grade of a C- satisfies a "grade of C or better" prerequisite and other "C-Wall" requirement, unless a "C Wall" is identified as a C not a C- in a course syllabus.

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.13.php

Grade Point Average

The number of credit hours attempted in a semester or summer session (for which grades of A, B, C, D (including plus/minus), or F are received) is divided into the total number of grade points earned to arrive at the Grade Point Average (GPA). The Grade Point Average will be calculated to three decimal points to a maximum of 4.000.

For example, if a student takes 16 credit hours, earning an A in two 3-credit courses, a B in one 3-credit course, and a B in one 2-credit course, a C in a 3-credit course, and an F in a 2-credit course, the grade point average would be:

Example GPA Calculation

6 (credits of A)	x	4 (grade points per credit hour)	=	24
5 (credits of B)	x	3 (grade points per credit hour)	=	15
3 (credits of C)	x	2 (grade points per credit hour)	=	6
2 (credits of F)	x	0 (grade points per credit hour)	=	0
				45

The total number of grade points earned (45) divided by the number of credit hours attempted (16) equals the grade point average, in this case 2.813.

Grading Guidelines

All instructors at NC State use the plus/minus grading scale in their courses. The plus/minus grading scale does not apply courses that are taken on a pass-fail basis.

Students enrolled in each section of a multiple section course in which the material, the sequencing of its treatment, and the examination are common to all sections should be graded on the same scale.

The following grades are not used in the calculation of grade point averages.

S	Satisfactory (Credit-only and certain other courses)
U	Unsatisfactory (Credit-only and certain other courses)
CR	Credit by Examination or Advanced Placement
IN	Incomplete
LA	Temporarily Late
AU	Audit
NR	No Recognition Given for Audit
W	Withdraw or Late Drop

Description of Letter Grades

D - Marginal. This grade is used to recognize that a student's performance was marginal but clearly better than that of students who receive an F.

F - Failing. This grade is used to indicate that the student has failed the course.

S - Satisfactory. This grade is used as a passing grade to be awarded only when the quality of the student's work is judged to be C- or higher level. It is used as the passing grade for students who are taking free elective courses under the credit-only option. It may also be used for certain courses such as orientation courses, seminars, and research problems, in which regular grades are not appropriate.

U - Unsatisfactory. This grade is used to indicate that the student is not to receive credit for a credit-only or other course for which the passing grade would be S (Satisfactory).

CR - Credit. This grade is used by the registrar to indicate course credit received by examination or advanced placement as certified by appropriate departments or colleges. This grade shall be awarded only when the advanced placement testing indicates that the quality of the student's work in the course would have been expected to be of C- or higher level.

IN - Incomplete. This grade is used as a temporary grade. At the discretion of the instructor, students may be given an **IN** grade for work not completed because of a serious interruption in their work not caused by their own negligence. An **IN** must not be used, however, as a substitute for an F when the student's performance in the course is deserving of an F. *An* **IN** *is only appropriate when the student's record in the course is such that the successful completion of particular assignments, projects, or tests missed as a result of a documented serious event would enable that student to pass the course. Work undertaken to make up the* **IN** *grade should be limited to the missed work.*

An **IN** grade must be made up by the end of the next regular semester (not including summer sessions) in which the student is enrolled, provided that this period is not longer than twelve months from the end of the semester or summer session in which the work was due. In the event that the instructor or department offering the course is not able to provide a student with the opportunity to make up the incomplete work by the end of the next regular semester in which the student is enrolled or within twelve months, whichever is shorter, the instructor or department offering the course must notify the Department of Registration and Records of the date of the extended deadline for removing the **IN** grade.

Any **IN** grade not removed by the end of the next regular semester in which the student is enrolled or by the end of twelve months, whichever is shorter, or by the extended deadline authorized by the instructor or the department offering the course and recorded by the Department of Registration and Records will automatically become a Failing (F) grade and will count as a course attempted.

Students should not register again for courses in which they have **IN** grades; such registration does not remove **IN** grades, and the completion of the course on the second occasion will automatically result in an F for the incomplete course.

When a *graduating senior* received an **IN**, the following procedures apply: (1) if the course is *needed* for graduation, the student will not be allowed to graduate until the work has been made up, and (2) if the course is *not needed* for graduation, the college dean must notify, in writing, the Department of Registration and Records either (a) that the course and the **IN** grade are to be deleted from the student's records; or (b) that permission has been given for the **IN** to remain and that a deadline has been established for the completion of the course. In the event that the course is subsequently not completed satisfactorily, the college dean shall notify, in writing, the Department of Registration and Records that the course and the **IN** grade should be deleted from the student's record or that the **IN** should be changed to F.

LA- Temporarily Late. An emergency symbol to be used only when grades cannot be reported on time by the teaching department or the professor. The **LA** differs from the IN grade in that the student receiving the **LA** has completed the work of the course including the examination.

The **LA** should not be used by a teaching department or the instructor unless it is absolutely necessary. When it is used the following procedure applies:

1. Grade Submission must be entered at the regularly scheduled time with the **LA** clearly indicated; and
2. A Grade Change Report form must be secured from the Department of Registration and Records, completed, and returned at the earliest possible time and not later than 15 days after the examination.

The semester grade reports of those students who receive an **LA** will not be complete. This situation often causes students to be uninformed as to their academic eligibility and as to the correctness of their schedule for the following semester.

Audits (Undergraduate)

AU- Audit. Given in recognition of successful completion of a course audit.

NR- No Recognition. Given for unsuccessful completion of a course audit.

Students wishing to audit a course before or after taking it for credit must have the approval of their adviser and of the department offering the course. Auditors are expected to attend class regularly. The degree to which an auditor must participate in class beyond regular attendance is optional with the instructor; any such requirements should be clearly explained in writing to the auditor at the beginning of the semester. Should the instructor conclude that poor attendance has resulted in an auditor's gaining little from the course, the instructor should mark **NR** (no recognition will be given for an audit) on the final grade report. Students who have take a course for audit may, with their adviser's approval, enroll in the course for credit during a subsequent semester or summer session. For tuition cost purposes, audits are treated as full credit value. For all other purposes, hours of audit do not count in calculating undergraduate course loads.

Note: Veteran's benefits are governed by Veterans Administration regulation concerning audits. Public Law 94502 (G.I. Bill) and Public Law 64 (sons and daughters of deceased or disabled veterans) consider only courses being taken for credit when determining a student's course load for benefit purposes. For information, contact the Veterans Affairs Office, 1000 Harris Hall, (919) 515-3048.

W- Withdrawal/Late Drop. Used on student's grade reports and transcripts to indicate all courses for which they have received official approval to drop or from which they have received official approval to withdraw after the deadlines for dropping.

Credit by Examination

Undergraduate students currently registered at NC State (degree, unclassified, or non-degree) may request an examination for course credit in a course whether enrolled in that course or not, under the conditions described below. Students must initiate a request with their adviser (except when a teaching department awards credit based upon group testing for placement purposes). Should the adviser approve, the student must arrange for the examination with the department offering the course. The department may administer the examination in any manner pertinent to the materials of the course. Departments are encouraged to offer credit by examination in all courses but have the prerogative of excluding certain courses, which are demonstrably unsuited for credit by examination.

The academic standards for credit by examination will be commensurate with the academic standards for the course. If a student's performance on the examination is judged to be of "C-" or higher quality, the department will notify the Department of Registration and Records on a Grade Change Report that the student has received Credit by Examination for the course. The Department of Registration and Records will enter the appropriate number of credit hours on the student's permanent academic record. Credits earned through Credit by Examination are not used in the computation of a student's grade point average.

The Department of Registration and Records will post course credit by examination to a student's permanent academic record only if that student is currently registered at NC State. However, if the course credit by examination would enable a student to complete the requirements for a degree, that student would not have to be registered in order to receive the credit.

If a student fails to achieve "C-" or higher quality work on an attempted credit by examination, no action is required other than the department's notifying the student. However, that student is not eligible for another such examination in the same course.

Once a student has failed a course or has completed credit or audit for more than fifty percent of a course, the student may not attempt credit by examination for that course. Under unusual circumstances, exceptions may be made upon the written recommendation of the student's adviser and the approval of the department offering the course. A student who receives credit by examination in a course in which that student is currently enrolled must officially drop that course no later than mid-semester.

Credit by Examination Through Independent Studies

Persons who are not currently enrolled on campus and who have gained through study or experience, knowledge of the content of undergraduate credit courses offered through Independent Studies may (with the approval of the Independent Studies staff and the academic department offering a course) receive credit for that course by special examination. Students may request approval to attempt credit by examination by completing and submitting a form available from Independent Studies, The University of North Carolina, Box 1020, The Friday Center, Chapel Hill, North Carolina 27599-1020, (919) 962-1104.

Currently enrolled students are not eligible for credit by examination through Independent Studies. These students should go directly to the appropriate academic department to request credit by examination under the regular procedures in effect on campus.

Credit Only Option for Free Elective Courses

Each undergraduate student has the option to count toward graduation requirements a maximum of 12 semester hours in the category of credit-only courses (exclusive of physical education activity courses and other courses authorized to be graded on Satisfactory/ Unsatisfactory basis). The student may select as credit-only any course offered by the university except those in Military Science, Naval Science, and Aerospace Studies. Students should check with their adviser before taking a course in their major, minor, GER or similar categories in the credit only status. The selected courses must be included under the free elective category of the specific curriculum in which the student is enrolled. The student will be responsible for attendance, assignments, and examinations.

The student's performance in a credit only course will be reported as S (satisfactory grade for credit-only course and given when course work is equivalent to C- or better) or U (no credit grade for credit-only course). The grade for a credit only course will have no effect on the student's Grade Point Average. The course and its grade will be counted in the cumulative hours attempted. Credit-only courses do not count in the calculation of eligibility for the Semester Dean's List, which requires either twelve hours or fifteen hours of course work for which grade points are earned.

Non-degree students may take on a credit-only basis any course for which they satisfy prerequisites. Students should be aware that many graduate and professional schools evaluate credit-only courses for which "U" grades were awarded as failing grades.

Transfer Credit

Transcripts of college course credit for new transfer students and for NC State students who have taken course work at another institution are evaluated by the Office of Undergraduate Admissions in consultation with the deans of the NC State colleges to determine how the work applies to fulfilling the graduation requirements of each student's intended major. Only courses where the student receives a grade of C- or better will be considered for transfer credit. Students admitted to an NC State undergraduate degree program who wish to take courses at another institution must obtain prior endorsement from their academic department and prior written approval from their college's associate dean (or dean's office) in order to insure that the transfer credits will apply toward specific graduation requirements. Transfer credit is not recorded on former students' permanent records until after they have been readmitted and have re-enrolled at NC State.

Credit accepted for transfer from another institution is shown only as credit hours and is not included in the computation of the grade point average. To see a list of courses and how they transfer to NC State from other institutions, please see: www7.acs.ncsu.edu/uga/course.htm. Please note this website speaks only to the general transferability of the course work. How transfer credit applies to a student's degree is determined by his/her academic department and college associate dean's office.

For the most current information regarding this regulation, please visit the following website: www.ncsu.edu/policies/academic_affairs/enrollment/admissions/REG230.01.2.php

Academic Honors

High ranking students in their freshman year are eligible for membership in *Phi Eta Sigma* and *Alpha Lambda Delta*. Both of these national scholastic honoraries require a 3.5 semester grade point average or better during the first semester or a cumulative average of 3.5 for both semesters during the freshman year. Juniors ranking in the top three percent of their class, seniors ranking in the top six percent of their class, and outstanding graduate students are eligible for election to membership in *Phi Kappa Phi*, the university's most prestigious campus-wide scholastic honor society. Outstanding undergraduate and graduate students majoring in the arts and sciences are also eligible for election to membership in *Phi Beta Kappa*.

For the most current information regarding this regulation, please visit the following website: www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.1.php

Semester Dean's List. A full-time undergraduate student who earns a semester average of 3.5 or better on 12 to 14 hours of course work for which grade points are earned or a semester average of 3.250 or better on 15 or more hours of course work for which grade points are earned will be placed on the Dean's List for that semester. Students are not eligible for the Dean's List in any semester in which they receive an F or IN grade. When IN grades are resolved, however, students who are otherwise eligible shall be added retroactively to the Dean's List for that semester. Dean's List recognition shall be noted on the student's semester grade report and permanent academic record.

Graduation with Honors. Undergraduate degree honor designations are:

Cum Laude- for GPA 3.25 through 3.499
Magna Cum Laude- for GPA 3.5 through 3.749
Summa Cum Laude- for GPA 3.75 and above

To be eligible for degree honor designations students must have completed at least two semesters and at least 30 credit hours at NC State.

Valedictorian, Salutatorian, and Highest Ranking Scholar in a College. To be eligible for consideration as valedictorian, salutatorian, or highest ranking scholar in a college, an undergraduate student must have received at least 100 academic credits at NC State (including credit by examination, advanced placement credit, and S/U courses). These 100 credits may include no more than 20 transfer credits through programs officially sponsored by NC State. Specifically, these programs are Cooperating Raleigh Colleges, National Student Exchange, International Student Exchange, NC State sponsored study abroad programs, and the affiliated hospital

programs in Medical Technology. All students whose accumulated grade point averages, based on all courses attempted at NC State, make them eligible for one of these honors, shall be so recognized. That is, in the case of ties, more than one student will receive the honor. However in the case of ties for valedictorian, no salutatorian will be recognized.

Grade Reports

Grade reports are not mailed at the end of each semester. Grades are posted online within 24 hours after instructors submit them to the Department of Registration and Records.

The Department of Registration and Records provides three methods in which students may gain access to term grades:

- **Pack Tracks:** www.ncsu.edu/registrar - Requires your Unity ID and password.
- **In Writing:** A printed copy of semester grades can be issued only at the written request of the student concerned. The written request should be submitted after the first day of classes, but before the last day of classes each semester and should include the following information: student's full name, student identification number, PIN, correct correspondence address and signature. The request should be mailed to: Department of Registration and Records, Box 7313, NC State University, Raleigh, NC 27695-7313.
- **In Person:** Students may come in person to the Department of Registration and Records, 1000 Harris Hall, and request a printed copy of grades for their last enrolled term. The student must show a picture ID to receive grades. Office hours are 8:00 a.m. to 5:00 p.m., Monday through Friday.

Transcripts of Academic Records

Official Transcripts
Official NC State University transcripts are a complete record of a student's academic work at the university. Transcripts are issued on official "SCRIP-SAFE" paper and carry the pre-printed signature of the University Registrar, the date of issue, and the pre-printed seal of the university. Sealed transcripts are also stamped with the Registrar's signature on the outside of the envelope.

An official transcript is issued only at the authorization or written request of the student concerned. There are three different ways to request official transcripts.

1. Order a transcript online. Use the transcript service provided by the National Student Clearinghouse to request an official transcript online 24 hours a day. Online orders can be placed at www.getmytranscript.com.
2. Fax or mail a request to Registration and Records for an official transcript. A transcript request form may be obtained online at www.ncsu.edu/registrar/forms.
3. Visit Registration and Records in person at 1000 Harris Hall and receive an official transcript.

Notes:
- The charge for official transcripts processed at Registration and Records is $10.00 for the first transcript and $5.00 for each additional transcript per order. Transcripts ordered through the National Student Clearinghouse are $10.00.
- There is an additional charge of $5.00 for transcripts faxed from Registration and Records. Registration and Records does not fax transcripts internationally.
- Official transcripts are not issued for those people who are indebted to the university until such indebtedness is paid or satisfactorily adjusted.
- Transcript requests will normally be processed within 24-48 hours. However, a longer period of time may be required for processing at the beginning and end of each semester.

Unofficial Transcripts
Currently registered students may obtain an unofficial transcript by accessing Pack Tracks and selecting Transcript from the Student Information menu.

Change of Name, Address, or Telephone

It is the student's responsibility to notify the Department of Registration and Records of any changes in name, address, or telephone. Failure to do so may prevent prompt delivery of important university correspondence and correct notification of hometown newspapers of honors received. International students are required by law to notify the university of any change or correction in name or address within 10 days. Updating address changes in the Pack Tracks system fulfills international students' federal requirements for maintaining status in SEVIS.

Name changes can only be completed in person at Registration and Records, 1000 Harris Hall by providing a picture ID and proof of the name change (i.e. driver's license, social security card) or by written authorization along with proof.

Changes of address or telephone can be completed in one of the following two ways:

- **Pack Tracks:** www.ncsu.edu/registrar - Requires Unity ID and password
- **In Writing:** The Change of Address form at www.ncsu.edu/registrar/forms/pdf/addresschange.pdf should be completed and sent to the Department of Registration and Records, Box 7313, NC State University, Raleigh, NC 27695 and must include your name, student ID number, PIN, new address and signature.

Double Degrees

Students who have satisfactorily completed the requirements for more than one bachelor's degree may, upon the recommendation of their deans, be awarded two bachelor's degrees at the same or at different commencement exercises. To earn two degrees, students register in one school or department and, with the cooperation of the second school or department, work out their program to cover the requirements for both. Students must file an approved Curriculum Change Form with Registration and Records, 1000 Harris Hall. An Application for Degree Form must be submitted for each degree.

Intra-Campus Transfers (Curriculum Change)

Regulation

1. A student who has attempted fewer than twelve credit hours at NC State may transfer to another curriculum provided that the student meets the admission requirements of the intended new curriculum.
2. A student who has attempted twelve or more credit hours at NC State may transfer to another curriculum provided that the student is eligible to do so under the intra-campus transfer policy which pertains to the intended curriculum.

Procedures for Intra-Campus Transfers

Undergraduate students wishing to change from one curriculum to another must report to the dean's office of the college offering the curriculum in which entrance is desired and request acceptance into the new college or curriculum. International students must meet with an Office of International Scholar and Student Services adviser and change their curriculum in SEVIS before submitting the Curriculum Change Form to the Department of Registration and Records.

If acceptance is approved, a Curriculum Change Form will be issued, bearing the signature of the accepting dean.

If the former curriculum was in a different college, the Curriculum Change Form should be submitted for the signature of the releasing dean with the request that all records be transferred to the new college and department.

From the standpoint of advising, pre-registration, and adding and dropping courses, the student is considered to be in the new curriculum as soon as the Curriculum Change Form is completed and filed with the Department of Registration and Records and the records of the student have been transferred to the new department. (See also "Readmission of Former and Suspended Degree Students" and "University Policies and College/Departmental Policies")

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.16.php

Academic Status

Continuation of Undergraduate Enrollment

All undergraduate students, including all Lifelong Education students, regardless of when they first enrolled in NC State University, are subject to this regulation.

Minimum Eligibility Standard

The minimum eligibility standard for continued enrollment for any undergraduate student is defined as achieving the required cumulative grade point average for the total number of credit hours attempted at NC State plus transferred credit hours according to the Schedule of Performance Requirements for Continuing Undergraduate Enrollment, referred to hereafter as the Continuation Schedule.

Credit Hours Attempted at NC State Plus Credit Hours Transferred	Minimum Required Cumulative Grade Point Average on all Courses Taken at NC State
1-59	1.8
60 or more	2.0

Undergraduate students who, at the end of any spring semester, do not meet the minimum standards shown in the Continuation Schedule will not be allowed to continue their enrollment at the university during subsequent fall and spring semesters, with the following exceptions:

- no student will be suspended until the end of the student's second regular semester at NC State;
- any student who begins a given semester with a cumulative GPA of 2.00 or better will be eligible to continue in the next regular semester in which they seek enrollment regardless of academic performance in that given semester;
- students who are eligible to continue at the end of a spring semester will be eligible to continue into the following fall, regardless of summer session performance;
- students will be eligible to continue their enrollment until they have attempted at least twelve hours at NC State; and
- suspended students re-admitted on appeal will be eligible to enroll on Academic Probation.

A student with a cumulative GPA below 2.00 will be in one of three academic statuses: Academic Warning, Academic Suspension, or Academic Probation.

Academic Warning
Every student who meets the criteria set forth in the above section, but whose cumulative grade point average is less than 2.00, the minimum for graduation, will be on Academic Warning Status. The Timely Advising Requirement applies to students on Academic Warning Status.

Academic Suspension
Academic Suspension Status is assigned at the end of the spring semester to students who do not meet the minimum eligibility standards and who were enrolled in either the fall or spring semester. Academically suspended students are subject to the provisions of the regulation on Readmission of Former and Academically Suspended Undergraduate Degree Students. International students who are suspended will have their programs terminated in SEVIS and must immediately meet with an Office of International Scholar and Student Services adviser to discuss immigration consequences and limited options for readmission or transfer.

Academic Probation
Academically suspended students may appeal to the University Admissions Committee for re-admission on Academic Probation Status in order to enroll in a regular semester (fall or spring). Students will not be considered in good academic standing while on Academic Probation Status. The Timely Advising Requirement applies to students on Academic Probation Status. The University Admissions Committee may prescribe additional requirements as a condition of re-admission. Students who obtain a cumulative GPA above the suspension level, after being placed on probation status, will have the probation status discontinued. Students who do not obtain a cumulative GPA above the suspension level, by the end of the spring semester after being placed on probation, will return to Academic Suspension Status.

Timely Advising Requirement
All students on Academic Warning Status or Academic Probation Status are required to meet with their academic advisers during the first four weeks of classes in regular semesters to review their academic situations and to formulate or review and revise as needed their plans of study. Any student in either of these statuses who does not comply with this requirement will not be allowed to register and continue enrollment at the university during subsequent fall and spring semesters unless the cumulative GPA of the student is 2.00 or greater at the end of the semester in which the requirement was not met.

For the most current information regarding these regulations, please visit the following website:
www.ncsu.edu/policies/academic_affairs/academic_progress/REG02.05.1.php

Readmission of Former and Suspended Degree Students

An undergraduate degree student who fails to enroll or attend at all, during any regular semester, is considered a "former degree student," and must re-apply for admission to continue. Readmission applications should be submitted as soon as possible but no later than 30 days prior to the date of desired enrollment. Former students returning should be aware that enrollment restrictions may be imposed at any time, which may affect their readmission.

A non-refundable charge must accompany all applications.

Readmission for Students Eligible to Continue
Students who were eligible to continue at NC State at the time of leaving and who have a grade point average of at least 2.0 on all courses taken at NC State are eligible to be readmitted to their former program, provided the program has the capacity to accept additional students.

A student who was eligible to continue at the time of leaving who has subsequently completed academic work at another institution and earned less than a C- average on such work must complete a readmission form and write a letter of petition to the Undergraduate Admissions Committee.

A student who was eligible to continue at the time of leaving and whose grade point average is less than 2.0 on all courses taken at NC State will be:

- Considered for readmission on Academic Warning status if the student's GPA is not lower than the level required to be eligible to continue under the current regulation; or
- Considered for readmission on Academic Probation Status for one semester if the student's GPA is below the level required to be eligible to continue under the current policy.
- Former students returning who desire a change of curriculum must be accepted into the desired major based upon current matriculation requirements and submit a properly validated Curriculum Change Form to the Department of Registration and Records before readmission can be processed. (See Intra-Campus Transfers)

Readmission for Suspended Students
A student whose grade point average on all courses taken at NC State is such that the student has been suspended may seek readmission under the rules in the sections below.

Readmitted academically suspended students will be on Academic Probation Status and will not be considered in good academic standing until such time as they meet the appropriate minimum cumulative GPA requirement based upon the university's Continuation of Undergraduate Enrollment regulation.

Any academically suspended student needing 14 or fewer credit hours for graduation and having a GP (Grade Point) deficit of 10 or less will be automatically readmitted to the university on Academic Probation Status for one semester without petitioning for readmission.

- Such students will be permitted to register for successive academic semesters provided that, following readmission, each semester GPA is at least 2.500 until such time as the cumulative GPA is 2.000 or greater (at which time the Academic Probation Status will be removed).
- Failure to achieve the required 2.500 semester GPA or the minimum overall GPA required by the Continuation of Undergraduate Enrollment regulation will result in an additional notice of academic suspension from the university at the end of either the fall or spring semester.
- So long as the student is on Probation Status, s/he will be limited to a maximum of 14 hours registration each semester (any exception must be approved by the adviser and Academic Dean of the college in which the student is enrolled).

Automatic Readmission Based on Academic Performance
A student who is academically suspended may enroll in NC State University Summer Session courses and NC State University Independent Studies courses in order to attempt to improve their overall academic performance.

With consent of the academic department in which the student was formally enrolled, a suspended student may enroll in NC State University Distance Education courses.

- Courses taken through this avenue must be consistent with the student's program of study.
- To facilitate taking distance education courses, a student must contact his/her academic adviser or the coordinator of advising in the student's major department to request departmental consent.

Enrollment in NC State University Summer Session, Independent Study, and/or Distance Education courses will be limited to a total of two courses (plus applicable labs) at any given time. An additional one credit hour Physical Education course can be added for students attending on campus summer sessions.

If grades earned through NC State Summer Session courses, Independent Study courses, or NC State Distance Education courses are sufficient to remove the suspension, the student may be automatically readmitted in the subsequent semester without admission committee review.

Readmission Based on Appeals to the University Admissions Committee
If the student chooses not to pursue any of the above course options or fails to earn grades sufficient to meet the minimum cumulative GPA requirement (based on the university's Continuation of Undergraduate Enrollment regulation), the following rules for appeals to the Undergraduate Admissions Committee will apply:

First Notice of Academic Suspension. Upon receiving the first notice of academic suspension from the university, a mandatory one regular semester break in enrollment will be imposed for the semester following receipt of the notice (i.e., the fall or spring semester).

During the one-semester break in enrollment, a suspended student may take advantage of an alternative readmission program. This requires a Psychoeducational Assessment offered by the University Counseling Center. The goal of this assessment is to help suspended students identify any underlying educational, behavioral, psychological, or medically related cause(s) of the previously poor educational performance and to make recommendations for adjustments. Students are strongly encouraged to participate in this intervention program.

- Upon verification by the Counseling Center of completion of the Psychoeducational Assessment the student will be eligible for readmission at the beginning of the next semester without admission committee review.
- For readmission in the spring semester, evaluations done at the NC State Counseling Center must be scheduled prior to August 15 and be completed by October 20. Note: Students would not be enrolled during the fall semester.
- For readmission in the fall semester, evaluations done at the NC State Counseling Center must be scheduled prior to May 1 and be completed by July 15. Note: Students would not be enrolled during the spring semester.
- Off-campus, licensed mental health service providers under the guidelines provided by the NC State Counseling Center may also conduct evaluations. Acceptable reports, however, must be filed and discussed by the student with a counselor at the Counseling Center by the October 20 and July 15 dates.

After an absence of at least one regular semester following the first notice of academic suspension, students choosing not to take advantage of the alternative readmission process may petition for readmission through the Admission Committee. The petition should provide evidence of motivation and/or achievement based on any academic work or systematic review of previous performance completed during the suspension period.

Upon readmission the student must meet with their academic adviser to update their plan of study and review their strategies for academic success. Failure to meet with the adviser and to update their plan of study may result in the cancellation of the student's enrollment.

Second Notice of Academic Suspension. Upon receiving the second notice of academic suspension from the university, a mandatory two regular semester break in enrollment will be imposed. At the end of the mandatory period, the student may petition the Undergraduate Admissions Committee for readmission.

Petitions for readmission must be accompanied by:

- transcript of any courses (including grades) taken during the suspension, and
- a detailed plan of study, developed with the assistance and approval of the adviser, or department designee, outlining courses to be taken in each subsequent semester and the level of performance (GPA and number of hours each semester) necessary to complete the degree requirements, and
- a written evaluation by the adviser candidly discussing the probability the student will be able to meet the performance expectations, and
- evidence that the student participated in the specified intervention program following the automatic reinstatement after the first academic suspension.

If the Admissions Committee decides to readmit the student:

- The student as a mandatory condition of continued enrollment must follow the negotiated plan of study. The plan of study shall specify the GPA to be maintained and the number of hours to be carried by the student each semester until graduation.
- This plan of study cannot replace or supersede university graduation requirements, such as the 2.000 overall GPA required for graduation, or any other requirements as may be specified in the student's curriculum regarding grade points, hours of D, etc., for graduation.
- As long as the student's cumulative GPA is less than the minimum required, this plan of study, when accepted by the university, will supersede the graduated Schedule of Performance Requirements for Continuing Undergraduate Enrollment ("continuation schedule") used to determine suspension.
- Failure to follow the plan of study will result in the cancellation of the student's enrollment and a third notice of suspension from the university.

If the student performs at a level to earn a cumulative GPA that exceeds 2.000, strict adherence to the plan of study may no longer be required. However, a student whose performance drops in subsequent semesters, will then be subject, to a third suspension for poor academic performance.

Third Notice of Academic Suspension. Upon the third notice of academic suspension, the student will be permanently suspended from the university, except as provided for under the Contractual Readmission Policy.

Contractual Readmission. (An appeal to Undergraduate Admissions Committee by students who have not been enrolled at NC State for three or more years) After not being enrolled at NC State (excluding Summer Sessions, Independent Studies, and NC State Distance Education courses) for a continuous three-year period or longer, a student whose former academic record at NC State was such that the student was suspended or would have been suspended under current policies, may petition the Undergraduate Admissions Committee for contractual readmission.

The Committee will decide each case on its individual merits with special regard to the student's written appeal, the productive use of the three or more intervening years, evidence of motivation and achievement based on any academic work done during those three or more years, and a supporting letter from the department offering the curriculum into which the student requests admission. This letter must contain a proposed plan of study agreed to and signed by the student, the department head, and the dean. If the curriculum into which the student requests admission is different from that in which the student was last enrolled, the petition to the Admissions Committee must also be accompanied by a Curriculum Change Form approved by the accepting dean.

If a contractual readmission is approved, the following conditions will apply:

- The student's entire academic record at NC State will be recorded on any subsequent transcript, including a grade point average on all work attempted at NC State.
- For courses attempted prior to readmission, only work of C- or better will count toward fulfilling graduation requirements, providing that such courses meet current curriculum requirements.
- For purposes of suspension and eligibility for graduation, a second grade point average will be calculated based only on courses that are attempted after readmission. Total hours for graduation and suspension will be based on all work at NC State after readmission plus former work of C- or better that is acceptable to the department plus hours transferred from other institutions.
- The student must maintain an overall grade point average of 2.0 or better on all courses attempted after readmission.
- Students who fail to achieve an overall grade point average of 2.0 will lose their contractual readmission status. Their status for subsequent work as a degree student at NC State shall be determined on the basis of total hours attempted at NC State plus transferred hours and their grade point average calculated using all courses attempted at NC State.
- A student may be readmitted under this option only once.

Notice of Readmission
Once a student has received notice of readmission, the student should pay the semester's tuition at the University Cashier's Office (2005 Harris Hall) and register for the schedule of courses agreed upon in consultation with her/his adviser. The student's ID number will be included in the notice of readmission.

Withdrawal from the University

Students who wish to drop all the courses for which they are registered must withdraw from the university for the remainder of the semester or summer session in which they are enrolled. Students who have registered and prepaid are considered to be registered and must be officially withdrawn, unless they have notified the university prior to the beginning of the first day of classes that they wish to have their registration cancelled.

The procedure for withdrawing is different in several ways from the procedure for dropping one or some courses but not all. First, the procedure is not initiated in the academic department or college. Second, a Schedule Revision Form is not used. Third, it is highly recommended, but not required, that students considering withdrawal consult their faculty adviser or department coordinator of advising. The withdrawal process is as follows.

Degree candidates and Unclassified students initiate the official withdrawal process with the Counseling Center, Student Health Center, (919) 515-2423. Parental approval to withdraw may be required for single students who are under eighteen.

Lifelong Education students contact Registration and Records, (919) 515-3154.

International students who wish to withdraw from the university must meet with an Office of International Scholar and Student Services adviser to effect a withdrawal in SEVIS before withdrawing from the university in order to protect their immigration status. International students who are contemplating a withdrawal must call OIS, (919) 515-2961 for an appointment.

NC State students carrying course work at another campus under the interinstitutional arrangement must contact the Department of Registration and Records, 1000 Harris Hall, (919) 515-1496, to initiate the paperwork necessary for removal from the class roll at the other institution.

Students visiting from other institutions who are registered for NC State course work under the Interinstitutional arrangement must initiate withdrawal on their home campus.

Financial Aid recipients who withdraw during the semester or summer sessions may be required to repay all or a portion of the aid received, depending on the date upon which the withdrawal is effective. All students are required to get clearance through the Office of Scholarships and Financial Aid during the withdrawal process to determine their individual repayment obligations.

Withdrawal After the Last Day of the Official Drop Period
It is considered that after the last day of the official drop period a student has become a partner in an implied contract with the university to continue until the end of the semester. Therefore, withdrawals without academic penalty are granted by the university only when exception circumstances exist.

Undergraduate and graduate degree students may receive late withdrawals through the Counseling Center under three conditions:

1. Certification by an appropriate medical professional of serious disruption in academic functioning for medical reasons. Such medical petitions are subject to review by a university physician and by the Counseling Center.
2. Certification by the Counseling Center of serious disruption in academic functioning because of an emotional problem or crisis. It is important to verify that (a) there has been a significant decrease in the student's usual level of psychological functioning and (b) that regaining that previous level of functioning will involve a process of sufficient academic disruption to make continuing as a student unreasonable. In this case a "hold" may often be placed on the student's readmission pending certification by the Counseling Center and/or independent psychologist/psychiatrist that the student has regained and can be expected to maintain that usual level of psychological competence.
3. Verification by the office of the student's college dean that a decision has been reached in accordance with that college's policies and procedures that a documented hardship of any kind which, responsibly handled, resulted in it being unreasonable to insist that the student continue. The hardship should normally have been reasonably unforeseeable.

Courses for which students are officially enrolled are recorded on the transcript without grades or grade points but with a notation of "W" to indicated approval to withdraw after the withdrawal deadline.

Repeating Courses

Course Repeat Policy
Students who repeat a course, regardless of the grade previously made, will have both grades counted in their cumulative grade point average.

- Undergraduate students may be allowed as many semester hours as are appropriate in the departmental curriculum for courses that are titled seminar, special topics, independent study or research (usually numbered 490-499 or 590-599) and cover topics different from those studied when the courses were taken previously. Unless a course satisfies one or the other of the above conditions, the semester hours will be counted only once toward the number of hours required for graduation even though students repeat and pass the course both times.
- The adviser's approval is required for students to repeat any course previously passed with a C- or better; no approval can be given for a grade of A or B. Nor will it be given when: students wish to repeat a lower division course that they have passed with a grade of C- or better after having successfully completed; students wish to take an introductory course after they have successfully completed an advanced course dealing with similar material.
- Students must not register again for any courses in which they have IN grades; such registration does not remove IN grades; and the completion of the course on the second occasion will automatically result in an F for the uncompleted course.

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.23.php

First Year Course Repeat Policy
For courses first attempted in 1995 Fall Semester and afterwards.

The first year course repeat policy is one of forgiveness that helps new NC State undergraduate students maintain good academic standing. The policy is necessary because new students lack familiarity with the university, and as a result, are more likely to make errors in their choice of courses and total course load.

Effects

- The eligible student who repeats a course while electing that the first year course repeat policy apply, will have the grade points and the credit hours attempted and earned on the first completion of the course removed from the calculation of the cumulative grade point average which will result from the removal of the grade points and credit hours attempted and earned on the first completion of the course will be calculated and recorded on the student's record after the second completion of the course.
- The course title and grade for the first completion will be shown on the official record with a code (R) to indicate that it was repeated and that the first grade was removed from the computation of the cumulative grade point average.
- The recorded grade point average of the student for the semester in which the course was originally taken will not be changed.
- Repeating a course and exercising the first year course repeat policy does not retroactively change the status of the student as to semester academic hours, academic warning, probation, or suspension in prior semesters.
- Many graduate and professional schools recompute grade point averages in the process of considering an application for admission to such programs. This recomputation of grade point averages may include restoring the cumulative grade point average effects of initial attempts at courses repeated under this policy.

Eligibility

1. the initial attempt and the repeat under this policy must be an NC State course;
2. the course being repeated was completed for the first time after the 1995 Second Summer Session;
3. the course being repeated must be at the 100- or 200- level;
4. the student received a grade below C- in the course that is to be repeated;
5. both attempts of the course were for letter grades; no unsuccessful audits or credit-only attempts may be repeated nor may repeats under the policy be made for audit or credit-only;
6. the student has not received credit for an advanced course dealing with the same subject matter as the course being repeated;
7. the first attempt of the course must have occurred within 12 months of the student's initial enrollment in any classification at NC State; this period is not lengthened by voluntary or involuntary failure to enroll in subsequent semesters or summer session, nor by enrolling at less than a minimum full-time load following the initial date of enrollment;
8. the second attempt is for the same course or for an approved substitute course;
9. the second attempt occurs in a regular semester or summer session which ends within 12 months of the completion of the first attempt of the course; if the course is not available during that period or if the student is not enrolled when it is available, then the second attempt must occur in the next regular semester during which the student is enrolled at NC State and the course is available;
10. the notice of Exercise of First Year Course Repeat Policy is filed by the student with the Department of Registration and Records on or before the "last day to drop a course without a grade for courses at the 400 level and below" of the semester or summer session in which the course is repeated.

Procedures

1. students are advised to consult with their advisers in making the decision to elect a course repeat under this policy.
2. the student must submit a Notice of Exercise of First Year Course Repeat to the Department Registration and Records on or before the last day to drop a course without a grade at the 400 level or below of the semester or summer session in which the course is repeated. Forms may be obtained from advisers, departmental coordinators of advising, associate deans for academic programs, or the Department of Registration and Records.

Code of Student Conduct

All students who enroll at NC State are required to adhere to the Code of Student Conduct. This code "sets our the kind of behavior that disrupts and inhibits the normal functioning of the university, and what action it will take to protect the community from such disruption." Academic and Non-Academic Misconduct, both on and off campus are addressed in the Code. Students will receive sanctions that may range from a warning to expulsion from the university. For more information contact the Office of Student Conduct at (919) 515-2963 or access the code through the following website: www.ncsu.edu/student_conduct.

GENERAL EDUCATION REQUIREMENTS

The program in General Education established the foundation for a lifetime of intellectual discovery, personal development, and community service while preparing students for advanced work in various academic and professional disciplines. Through the teaching of courses offered in each of the following subject areas as well as in the delivery of the academic disciplines, the General Education program will:

1. Provide instruction that enables students to master basic concepts of a broad array of the intellectual disciplines,
2. Help students develop versatility of mind, an ability to examine problems individually and collaboratively from multiple perspectives, including ethical and aesthetic perspectives,
3. Provide students the guidance and skills necessary to become intellectually disciplined, to be able to construct arguments that are clear, precise, accurate, and of relevant depth and breadth,
4. Encourage students to take personal responsibility for their education, including the ability to find, evaluate and communicate new information, setting the stage for life-long learning.

For the most current information available, please see the following website: www.ncsu.edu/uap/academic-standards/ger/ratobj.html

Mathematical Sciences

Rationale: A logical approach to problem solving is important for successful functioning in society. It is also important that students be able to formulate models, be critical consumers of quantitative information, communicate mathematically and solve problems.

Objectives for courses in the category of Mathematics: Each course in the Mathematical Sciences category of the General Education Requirements will provide instruction and guidance that help students to:

1. improve and refine mathematical problem-solving abilities; and
2. develop logical reasoning skills.

Natural Sciences

Rationale: The natural sciences pursue basic questions about the workings of the universe, and the richness, variety and interconnectedness of the world around us. Students today are exposed to an increasing volume of information, from a large variety of sources, in diverse and changing formats. Training in the natural sciences is essential to help students develop skills to distinguish between testable and un-testable ideas, recognize scientifically valid tests of theories, and understand how information relates to those tests. By studying the natural sciences, students learn to reason both inductively and deductively, develop and test scientific hypotheses, and understand the value and limitations of scientific studies. The development and application of new technologies require scientifically literate citizens who can understand technological issues and evaluate the role of science in society's debate of those issues.

Objectives for courses in the category of Natural Sciences: Each course in the Natural Sciences category of the General Education Requirements will provide instruction and guidance that help the student to:

1. use the methods and processes of science in testing hypotheses, solving problems and making decisions; and
2. articulate, make inferences from, and apply to problem solving, scientific concepts, principles, laws, and theories.

Minimum Requirements in Mathematical and Natural Science for all Curricula (20 hours)
A total of six courses (20 hours) in the mathematical and natural sciences.

1. Two courses (6 hours) selected from mathematics, statistics, and logic; one must be a mathematics course.
2. Three courses (11 hours) from the natural sciences; two from different basic sciences (biology, chemistry, earth sciences, and physics); two of the three courses must have a laboratory.
3. The sixth course (3 hours) selected from any of the mathematical science, natural science, or from the science and technology perspective of the science, technology and society courses.

Writing, Speaking and Informational Literacy

Rationale: Writing and speaking are powerful ways of understanding ourselves and the world in which we live. It is through writing and speaking that the various disciplines and professions define the knowledge and methodologies that characterize them. And because effective writing and speaking in academic and professional settings often demand proficiency in the use of information technologies and resources, students must have a basic understanding of how information is identified and defined by experts, structured, organized, and accessed, in both the print and digital environments. Mastery of communication arts and information skills is central to engaging in the productive life of academic and professional communities.

Objectives for courses in the category of Writing, Speaking and Information Literacy: Each course in the Writing and Speaking category of the General Education Requirements will provide instruction and guidance that help students to:

1. communicate effectively in specific writing or speaking situations, which may include various academic, professional, or civic situations; and
2. understand and respond appropriately to the critical elements that shape communication situations, such as audience, purpose, and genre; and
3. critique their own writing or speaking and provide effective and useful feedback to enable other students to improve their writing or speaking; and
4. demonstrate critical and evaluative thinking skills in locating, analyzing, synthesizing, and using information in writing or speaking activities.

Minimum Requirements in Writing and Speaking for all Curricula (7 hours)

1. One semester of composition and rhetoric during the freshman year. (English 101 - 4 credits)
2. One semester from any of the following:
   a) advanced writing,
   b) speech, or
   c) foreign language (FL 201 or higher in the student's first foreign language or any FL course in a second language).
3. In addition, each curriculum is designed so that upper-level courses and other programmatic experiences help students write and speak competently in the discipline, including the ability to retrieve, evaluate, and manage information in ways that are appropriate to the discipline. In each curriculum, the design and delivery of that support are guided by various forms of programmatic assessment.

Humanities and Social Sciences

Rationale: The humanities and the social sciences comprise the subjects and disciplines that use various modes of rational inquiry to understand human nature and experience, organization and change in human societies, the nature of the world, and rational inquiry itself. An education in the humanities and social sciences requires reading significant works, gaining an exposure to a variety of methodologies, and learning to apply these in written exposition. An education in the basic humanistic disciplines is a necessary part of being truly educated— of becoming a citizen with a broad knowledge of human cultures and with well-considered moral, philosophical, aesthetic, and intellectual convictions.

Objectives for courses in the category of Humanities and Social Sciences: Each course in the general humanities category of the General Education Requirements will provide instruction and guidance that help students to:

1. understand and engage in the human experience through the interpretation of human culture and artifacts (this objective must be the central focus of each humanities course); and
2. become aware of the act of interpretation itself as a critical form of knowing in the humanities; and
3. make academic arguments about the human experience using reasons and evidence for supporting those reasons that are appropriate to the humanities.

In addition, each course appearing on one of the specific humanities and social science lists meets the objectives for the specific category as detailed below:

Literature: The study of literature introduces students to the many ways of deriving meaning from the human condition and to the many forms in which meaning is expressed. Studying literature also develops students' capacity for critical analysis and personal expression, their aesthetic sensitivity, and their reading and writing skills.

Objectives for courses in the category of Literature: Each course within the Literature category of the General Education Requirements in the Humanities will provide instruction and guidance that help students to:

1. understand and engage in the human experience through the interpretation of literature (this objective must be the central focus of each literature course); and
2. become aware of the act of interpretation itself as a critical form of knowing in the study of literature; and
3. make scholarly arguments about literature using reasons and ways of supporting those reasons that are appropriate to the field of study.

Objectives for courses in the category of History: The study of history provides an understanding of continuities and changes in human thought and behavior and of the ongoing process in which individuals shape and are shaped by their societies and their governments. Studying history also provides training in the analysis of process and the evaluation of a wide variety of evidence.

Each course in the History category of the General Education Requirements will provide instruction and guidance that help students to:

1. understand and engage in the human experience through the interpretation of evidence from the past situated in geotemporal context (this objective must be the central focus of each history course); and
2. become aware of the act of historical interpretation itself, through which historians use varieties of evidence to offer perspectives on the meaning of the past; and
3. make academic arguments about history using reasons and evidence for supporting those reasons that are appropriate to the field of study.

Philosophy: In the study of philosophy, students are exposed to the rigorous procedures of philosophical thought, to ethical issues, and to the insights of ethical reasoning.

Objectives for courses in the category of Philosophy: Each course in the Philosophy category of the General Education Requirements will provide instruction and guidance that help students to:

1. understand and engage in the human experience through the philosophical study of human thought, human values, and the world (this objective must be the central focus of each philosophy course); and
2. become aware of the acts of understanding and engagement itself as critical parts of the study of philosophy; and
3. make philosophical arguments using reasons and ways of supporting those reasons that are appropriate to the field of study.

Religion: In the study of religions, students are introduced to beliefs of their own and other cultures, and they learn how various religions have resolved ethical issues and have addressed the human condition.

Objectives for courses in the category of Religion: Each course in the Religion category of the General Education Requirements will provide instruction and guidance that help students to:

1. understand and engage in the human experience through the interpretation of religious cultures and artifacts (this objective must be the central focus of each religion course); and
2. become aware of the act of interpretation itself as a critical form of knowing in the study of religion; and
3. make arguments about religion using reasons and ways of supporting those reasons that are appropriate to the field of study.

Visual and Performing Arts: Courses in the visual and performing arts deal with aesthetic, personal, practical, and cultural significance of the fine and applied arts. The visual and performing arts develop students' aesthetic sensitivities, critical judgment, and personal creativity. They also provide students with an understanding of the cultural and historical dimensions of artistic expression.

Objectives for courses in the category of Visual and Performing Arts: Each course in the Visual and Performing Arts category of the General Education Requirements will provide instruction and guidance that help students to:

1. deepen their understanding of aesthetic, cultural, and historical dimensions of artistic traditions; and
2. strengthen their ability to interpret and make critical judgments about the arts through the analysis of structure, form, and style of specific works; and
3. strengthen their ability to create, recreate, or evaluate art based upon techniques and standards appropriate to the genre.

Social Sciences: The study of social sciences enables students to understand individual and collective human behavior by exploring meaning within a variety of social, cultural and political contexts; by analyzing the structures within which human goals are established and human choices are made; and by applying theoretical and quantitative models to specific cases.

Objectives for courses in the category of Social Sciences: Each course in the Social Science category of the General Education Requirements will provide instruction and guidance that help students to:

1. understand at least one of the following: human behavior, mental processes, organizational processes, or institutional processes; and
2. understand how social scientific methods may be applied to the study of human behavior, mental processes, organizational processes, or institutional processes; and
3. use theories or concepts of the social sciences to understand real-world problems, including the underlying origins of such problems.

Minimum Requirements in Humanities and Social Sciences for all Curricula (21 hours)
The general education requirements in the Humanities and Social Sciences are designed to expose students to content areas that demonstrate the relevant modes of inquiry:

1. One course in the study of literature (3 hours).
2. One course in the study of philosophy, religion, or history (3 hours).
3. One course in the study of visual and performing arts (3 hours). Alternatively, this requirement may be fulfilled by a course in the study of history.
4. Two social science courses from different content areas, in the study of psychology, economics, politics and government, sociology, anthropology, cultural geography and linguistics (6 hours).
5. Two additional courses selected within Humanities and Social Sciences (6 hours).

- These hours could be used to pursue specific interests, to provide additional breadth or depth by taking courses focused on a common theme.
- Courses can be selected from among any of the humanities and social sciences course lists. One of them may be from the Humanities and Social Science perspective of the Science, Technology and Society list.
- Students may, but are not required to, fulfill this requirement by taking a course(s) on the Humanities and Social Sciences Additional List. The chief purpose of the Humanities and Social Sciences Additional List is to indicate courses that may have pre-requisites and may be more advanced than courses on the primary Humanities and Social Science lists.

6. Among the courses selected to fulfill the Humanities and Social Sciences requirement at least one must focus on a non-English speaking culture.

Foreign Language

Rationale: In a sense, languages are keys to the world. The continuous expansion of international relations makes the knowledge of foreign languages increasingly significant. In learning a foreign language and studying its literature and cultures, students acquire a body of knowledge about how humans think, view the world, express themselves, and communicate with one another.

Language learning also expands one's ability to create and discover new meaning in one's own language and culture. Knowledge of the linguistic structures of a second language helps students to understand their own language better. Likewise, an awareness of contrasting cultural concepts sensitizes students to the differences between their own culture and others.

Such awareness has become increasingly important as the communities of the world have become more interconnected and interdependent. The needs of our global society require that more citizens have access to other languages and cultures in order to cooperate in the process of improving the quality of human life.

Minimum Requirements in Foreign Language for all Curricula

Foreign language proficiency at the FL102 level. This can be demonstrated by completing two years of high school study of the same language with the grade of C or better in each of the two years, or a passing grade at the FL102 level, or by placement into the FL201 by examination. Additional requirements have been established by some colleges and programs

Physical Education

Rationale: The development of attitudes and skills for a healthy life is essential to a university student's education. In addition to developing and gaining an appreciation of health-related fitness and wellness concepts and fundamental motor skills, student participation in physical activities and sport significantly decreases major health risks, reduces stress from the pressures of academic life, and improves general social and mental well-being.

Objectives for courses in the category of Physical Education: Each course in the Physical Education category of the General Education Requirements will provide instruction and guidance that help students to:

1. learn the fundamentals of health-related fitness, encompassing cardio-respiratory and cardiovascular endurance, muscular strength and endurance, muscular flexibility and body composition; and
2. apply knowledge of the fundamentals of health-related fitness toward developing, maintaining, and sustaining an active and healthy lifestyle; and
3. acquire or enhance the basic motor skills and skill-related competencies, concepts, and strategies of physical activities and sport; and
4. gain a thorough working knowledge, appreciation, and understanding of the spirit and rules, history, safety, and etiquette of physical activities and sport.

Minimum Requirements in Physical Education for all Curricula
Two credit hours, one each in physical education

1. Two courses including one Fitness and Wellness course (PE 100-level courses).
2. All courses will be available on an S/U basis but students have the option of taking the courses for a letter (A, B, C, etc.) grade.

Science, Technology and Society

Rationale: North Carolina State University, as a land-grant university, has a mission that stresses the application of science and technology for the betterment of humankind. It is essential, therefore, that students be exposed to the vital interactions among science, technology, society, and the quality of life.

Objectives for courses in the category of Science, Technology & Society: Courses fulfilling the Science, Technology & Society requirement should have as a central instructional focus the following objectives. To provide sustained, rigorous, and substantive instruction, efforts to meet the GER Science, Technology & Society objectives should be evident across the entire syllabus and be

reflected in course lectures, discussion, readings, projects, assignments, etc. Each course in the Science, Technology & Society category of the GER will provide instruction and guidance that help students to:

1. develop an understanding of the mutual relationships between science or technology and societies, including the effects of or the effects on cultures, values, industries, governments, or other facets of those societies.
2. develop an ability to critically evaluate information regarding these mutual relationships, recognizing that the information may come from a variety of sources and perspectives.

Minimum Requirements in Science, Technology and Society for all Curricula

Courses which satisfy this requirement can be oriented toward science and technology or toward the humanities and social sciences. Students in science and technology should study this topic from a humanities and social sciences perspective. Students with majors in the humanities and social sciences should study this topic from a science and technology perspective. This course can also partially satisfy either the humanities and social sciences requirement or the mathematical and natural sciences requirement (#3) but not both. This requirement can be satisfied by an interdisciplinary course designed to cover both perspectives.

Technology Fluency

Rationale: Today's graduate must achieve technology fluency appropriate to the needs of his/her discipline, including technologies for problem solving, empirical inquiry and research. Students will demonstrate critical thinking skills, analytical skills, proficiency and ethical use of the technology within the discipline, which includes responding to and readily adapting to change in those technologies.

Requirement: Instruction in technologies appropriate to the discipline will be included and assessed within each curriculum.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

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Marcy L. Bullock, Director of Career Services
Tricia Buddin, Coordinator of Recruiting

College of Agriculture and Life Sciences

Academic programs in the college represent a unique blending of the agriculture and life sciences. Agriculture is a very diverse industry that touches everyone's life in some way or another. The life sciences provide foundations for studying medical and health-related disciplines as well as environmental experiences and molecular biology.

The goals of the instructional program in the College of Agriculture and Life Sciences include proving relevant, scientific, and practical knowledge of the food, agricultural, and life sciences to its students. These programs emanate from a highly qualified and accomplished faculty committed to academic excellence and the development of the individuals to their personal and professional potential. Central to the college's goals is the cultivation of interdisciplinary problem-solving skills that will serve its graduates well as they pursue a lifetime of learning and adaptation to change.

The overall objectives of the academic program include:

- To provide an opportunity for a broad university education
- To provide a variety of learning experiences
- To offer a choice of specialization in agriculture and life sciences
- To provide background for graduate or professional programs

Degrees

- The Bachelor of Science degree is conferred upon the completion of one of the curricula in this college.
- The degrees of Master of Science, or Master of (non-thesis) degrees are offered in the various departments in the college.
- The Doctor of Philosophy degree is offered in the following subject areas: animal science and poultry science, biochemistry, bio-informatics, biological and agricultural engineering, crop science, economics, entomology, financial mathematics, food science, functional genomics, genetics, horticultural science, immunology, microbiology, nutrition, physiology, plant biology, plant pathology, sociology, soil science, toxicology, and zoology.

*Further information on graduate offerings may be found in the *Graduate Catalog*.

Curriculum Offerings and Requirements

A freshman enrolling in Agriculture and Life Sciences has common core courses. The first year-courses are appropriate in all curricula. This approach allows the student time to explore various programs before selecting a curriculum. The student selects a major in a department or interdisciplinary program. All departments offer science curricula (intended primarily for students who anticipate attending graduate or professional school), several technology curricula, and the Agricultural Business Management curriculum is offered in the Department of Agriculture and Resource Economics.

Departmental Majors

Business major: agricultural business management is offered through the Department of Agricultural and Resource Economics. A concentration in biological sciences and the opportunity for double majoring in business and other programs are available.

Science majors: agricultural education, agronomy, animal science, applied sociology, biochemistry, biological engineering (joint program with the College of Engineering), biological sciences, criminology, environmental sciences (joint program with the Colleges of Natural Resources and Physical and Mathematical Sciences), extension education, food science, horticultural science, microbiology, plant biology, poultry science, turfgrass science, and zoology. Preprofessional courses are offered in the science curriculum track.

Technology/Industry majors: agricultural and environmental technology, agronomy, animal science, food science, horticultural science, poultry science, and turfgrass science.

Freshman Year

The curricula in the College of Agriculture and Life Sciences have a common freshman year with the exception of the accredited engineering program offered through the Department of Biological and Agricultural Engineering. For the freshman year of that curriculum, see the College of Engineering.

Academic Minors

Several departments in the College of Agriculture and Life Sciences offer a minor in their discipline. Students interested in additional information regarding a minor should contact the appropriate departmental office. At present, the following minors are available:

Minor	Department
Agricultural Business Management*	Agricultural and Resource Economics
Agricultural and Environmental Technology	Biological and Agricultural Engineering
Agroecology	Crop Science
Animal Science	Animal Science
Applied Sociology	Sociology and Anthropology
Biological Sciences	Biological Sciences

continued on next page

Minor	Department
Biotechnology	Biological Sciences
Crop Science	Crop Science
Entomology	Entomology
Environmental Toxicology	Toxicology
Extension Education	Agricultural and Extension Education
Feed Milling	Poultry Science
Food Science	Food Science
Genetics	Genetics
Horticultural Science	Horticultural Science
Microbiology	Microbiology
Nutrition	Food Science
Plant Biology	Plant Biology
Poultry Science	Poultry Science
Soil Science	Soil Science
Wetland Assessment	Fisheries and Wildlife Sciences
Zoology	Zoology

*Available via Distance Education

Student Activities

Students in the College of Agriculture and Life Sciences have numerous opportunities to take part in broadening extracurricular activities. Most departments have student organizations that provide the professional as well as social experience. Representatives of these clubs form the Agri-Life Council. This council is the student organization representing the college. Student tours provide an opportunity to see firsthand the application of classroom principles. In addition, students representing agrimarketing, agronomy, animal science, horticultural science, food science, poultry science and soil science compete regionally and nationally in a number of activities, providing student members a chance to learn by travel as well as by participation.

Honors Program

The College of Agriculture and Life Sciences has a comprehensive honors program for qualified students throughout their academic careers. Both seminar discussion programs covering broad topics and an independent research program are included. Faculty provide direction on an individual basis to each student with the students selecting their projects. Participation in the CALS Honors Program is limited to CALS students with a GPA of 3.35 or above. The following ALS courses, 398H, 498H, 499H, are required. In addition, a student must take at least 6 hours of 300 level or above honors course work (at least 3 credit hours from CALS) or advanced courses such as 500-level courses in related fields or complete the University Scholars Program or University Honors program. Honors course work must be completed with a "C" or better.

Joint College Honors Program

The Department of Molecular and Structural Biochemistry's Honors Program, which is administered through the College of Agriculture and Life Sciences and the College of Physical and Mathematical Sciences, is designed to encourage excellent undergraduate biochemistry majors to develop their academic potential through a selection of courses and research that will challenge their abilities and better prepare them for postgraduate careers.

To be admitted to this program, a student must have at least a 3.5 overall GPA, including grades B or better in calculus (MA 141, 241, 242), general chemistry (CH 101, 201, 202), organic chemistry (CH 221, 223), and calculus based physics (PY 205, 208). To complete the program, the student must take two semesters of physical chemistry (CH 431, 433) and a minimum of 9 credit hours must be drawn from at least two of the following three categories with at least three credit hours in biochemical-related research. A written scientific report based on the student's research is required.

- Designated Honors courses, such as BCH 451H, GN 411H, or MB 351H
- Advanced courses, such as 500-level courses in related fields
- Research, such as BCH 492, BCH 493, or ALS 498H and 499H (minimum of 3 hours)

Honor Societies

Students in all majors with strong academic records are recognized by national organizations that have local chapters, Gamma Sigma Delta, Alpha Zeta, Alpha Epsilon Delta, and Phi Kappa Phi.

Scholarship Program

The College of Agriculture and Life Sciences awards approximately 625 scholarships each year on a combination of selection factors including merit, financial need, and leadership.

Jefferson Scholars in Agriculture/Life Sciences and the Humanities
The Thomas Jefferson Scholars Program in Agriculture and Life Sciences and the Humanities is a joint program of the College of Agriculture and Life Sciences and the College of Humanities and Social Sciences. It is a program that leads participants to two degrees: one concentrating in an area of agriculture or life science and one in an area of humanities or social science. All majors in

each college are available to meet each student's particular interests and career goals. The purpose of the program is to produce potential leaders in agriculture and the life sciences who have not only technical expertise but also an appreciation for the social, political, and cultural issues that affect decision-making. The program includes special classes for Jefferson Scholars and a variety of social and service activities. Each spring a number of entering freshmen are chosen to participate in the Jefferson Program. Successful participants receive scholarship support after the sophomore year.

Rising freshmen interested in applying to the Jefferson Scholars program should contact either of the following people before January 15. An online application is available. Visit the Jefferson Scholars website for details at www.cals.ncsu.edu/student_orgs/jeffer.

Dr. Kenneth L. Esbenshade, Associate Dean
College of Agriculture and Life Sciences
NCSU Box 7642, Raleigh, NC 27695
phone: (919) 515-2614

Dr. Laura Severin, Associate Dean
College of Humanities and Social Sciences
NCSU Box 8101, Raleigh, NC 27695
phone: (919) 515-2468

INTERDISCIPLINARY PROGRAMS

Curricula in Agronomy

Williams Hall, Room 2126
phone: (919) 515-3666
website: www.cropsci.ncsu.edu

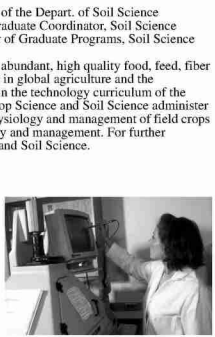
W.D.Smith, Head of the Department of Crop Science
J. F. Spears, Undergraduate Coordinator, Crop Science
R. Wells, Director of Graduate Programs, Crop Science

M. G. Wagger, Head of the Depart. of Soil Science
H. J. Kleiss, Undergraduate Coordinator, Soil Science
T. J. Smyth, Director of Graduate Programs, Soil Science

Agronomy is the development and practical application of plant and soil sciences to produce abundant, high quality food, feed, fiber and specialty crops in an environmentally sustainable manner. Agronomists serve a vital role in global agriculture and the maintenance of environmental quality. Students may earn a Bachelor of Science degree within the technology curriculum of the College of Agriculture and Life Sciences with a major in Agronomy. The Departments of Crop Science and Soil Science administer the agronomy curriculum jointly. Crop Science relates primarily to the genetics, breeding, physiology and management of field crops and turf. Soil Science is oriented toward soil physics, chemistry, origin, microbiology, fertility and management. For further information and employment opportunities, see the departmental headings for Crop Science and Soil Science.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Curricula in Biological Sciences



Bostian Hall, Room 2717
phone: (919) 515-3341
website: www.cals.ncsu.edu/bio_sci

D. Shea, Head
W. C. Grant, Undergraduate Coordinator

Professors: B.L. Black, W.C. Grant, R.P. Patterson, D. Shea; Associate Professors: R.L. Beckmann, J.E. Mickle, M. Niedzlek-Feaver; Teaching Assistant Professors: M. Engell, M. Ferzli, A.P. Flick, M.B. Hawkins; Faculty Lecturers: L.D. Parks, J.L. Campbell; Laboratory Supervisor: P.M. Aune; Laboratory Manager: T.B. Johansson; Teaching Technician: W.P. Crumpler

The Biological Sciences are a broad and rapidly evolving matrix of disciplines with a focus on understanding life, and an ultimate goal of improving the quality of life for humans and the living world that we share. Biology is the basis of all the life science and health fields, and is experiencing its most rapid and exciting growth in our history. The *Science of Life* is a fascinating course of study with almost unlimited opportunities for intellectual pursuits and career opportunities.

The B.S. in Biological Sciences is excellent preparation for rewarding careers and further studies in the health professions and life sciences. Graduates have the skills and credentials required for employment in biotechnology, biomedical, environmental, genomic, medical, pharmaceutical, and other life sciences careers. Students also receive excellent preparation for graduate studies in the life sciences and professional training in dentistry, medicine, optometry, veterinary medicine and other health-related fields. The Biological Sciences Program has a very strong link to the health professions and administers the Health Professions Advising Center for the university. Biological Sciences students who plan to seek certification for pre-college teaching may select a second major in the Department of Mathematics, Science, and Technology Education.

The B.S. Degree in Biological Sciences provides comprehensive training in biology and the supporting sciences, exploring the structure, function, behavior, and evolution of cells, organisms, populations, and ecosystems. The degree program is designed to provide flexibility for students with general interest in biology and also for those preparing for more focused studies and training in the health professions or graduate studies in the life sciences.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Biological Sciences

The Biological Sciences Program offers an undergraduate minor in Biological Sciences that is open to all baccalaureate students except Biochemistry, Microbiology, Plant Biology and Zoology majors. This minor is intended to enhance the programs of students whose major fields are outside the biological sciences and who are interested in obtaining a broad-based perspective in the biological sciences. The minor requires a minimum of 15 semester hours. Course requirements provide students an opportunity to gain knowledge and acquire laboratory skills in several topical areas that contribute to the biological sciences.

Curricula in Environmental Sciences

Nelson Hall, Room 3304; Williams Hall, Room 2321; Clark Hall, Room 120

A. W. Oltmans, Coordinator, Economic Policy Concentration (Nelson Hall, Room 3304)
H. J. Kleiss, Coordinator, Environmental Soil Science Concentration (Williams Hall, Room 2321)
N. M. Haddad, Coordinator, Ecology Concentration (Clark Hall, Room 120)

Environmental sciences, in the broadest sense, are concerned with the development of basic knowledge about the world's environments and the use of this knowledge to create new and more efficient ways to maintain or enhance the environment for society's benefit. Given the complexity of environmental processes and the many ways in which humans interact with natural environments, a multidisciplinary systems approach is essential for understanding changes in natural environments. Society's future prospects maintaining and improving our environment depends on advances in economics, other social science and humanities and the use of these advances to develop and maintain effective economic, political, and social structures.

Public concern about environmental issues and the resource costs for protecting our environment is increasing. Protecting and improving our environment involves knowledge and systematic problem-solving skills, which will be essential for environmental scientists. Ecologists and other environmental scientists must be conversant with economics, other social sciences, and humanities, while environmental economists and political scientists must be competent in the use of mathematical models and statistics. North Carolina State University's environmental science degree program provides sound training in each of these areas. Successful completion of this diverse and challenging program requires a sound academic background and hard work.

To accommodate the complexity and breadth of environmental sciences, the Bachelor of Science degree in environmental science is a campus-wide program involving two colleges and five departments that administer six concentrations. A common core of 89 hours provides a balanced foundation in communication, humanities, social sciences, mathematics, and the natural sciences. The core requirements include a freshman introductory environmental science course and a capstone course for seniors in which teams of students from the various concentrations work together on environmental problems from ecological, physical and economic perspectives. Three departments within the College of Agriculture and Life Sciences offer an environmental sciences concentration that allows students to specialize in areas within environmental science: Ecology (see Department of Zoology), Economic Policy (see Department of Agricultural and Resource Economics) and Environmental Soil Science (see Department of Soil Science). For information on other concentrations, see the Department of Marine, Earth, and Atmospheric Sciences, the Department of Statistics within the College of Physical and Mathematical Sciences and the Department of Forestry within the College of Natural Resources.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Curricula in Natural Resources

A. W. Oltmans, Undergraduate Coordinator Agricultural and Resource Economics; Nelson Hall Room 3304A
H. J. Kleiss, Undergraduate Coordinator Soil Science; Williams Hall, Room 2321

Wise use of all our natural resources (soil, water, air, minerals, flora, fauna, and people) for the benefit of current and future members of society is the goal of natural resource management. This important challenge recognizes the interdependence of people with their environment and requires an integrated, multi-disciplinary approach to solving society's resource problems. Population growth, rising incomes, life style changes and urbanization lead to more intensive use of all natural resources. These trends present challenges to resource managers who must be trained in the basic principles of several disciplines in order to develop and apply sound management strategies to our resource problems. Natural resource professionals must understand resources and the social systems governing their use. They must be able to work in teams to analyze potential effects of resource use and to design ways to make efficient use of natural and environmental resources for current and future generations.

To accommodate the breadth and complexity of natural resource management, the Bachelor of Science degree in Natural Resources is a campus-wide program involving three colleges and four departments that administer seven concentrations. A common core of 84 credit hours of course work provides a balanced foundation in communication, humanities, social sciences, mathematics and the natural sciences. The core course requirements include a freshman orientation course and a senior level applications course that natural resource majors in all concentrations must complete. Within the College of Agriculture and Life Sciences, three concentrations are available: Economics and Management, Soil Resources, and Soil and Water Systems. For information on other concentrations see the Department of Forestry in the College of Natural Resources and the Department of Marine, Earth and Atmospheric Sciences in the College of Physical and Mathematical Sciences.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF AGRICULTURAL AND EXTENSION EDUCATION

Ricks Hall, Room 216
phone: (919) 515-2707
website: www.cals.ncsu.edu/agexed

J. L. Flowers, Head, Undergraduate Coordinator, and Coordinator of Advising
G. E. Moore, Director of Graduate Programs
J. Richardson, Department Extension Leader

Professors: G.W. Bostick, J.L. Flowers, G.E. Moore; Professors Emeriti: R.D. Mustian, R.W. Shearon; Associate Professors: D.B. Croom, L.W. Guion, E.B. Wilson; Associate Professor Emeriti: R.T. Liles; Assistant Professors: K.S.U. Jayaratine, D.W. Jones, M.J. Kistler; Extension Specialist-Educational Programs: J.G. Richardson; Extension Associates: G. Barlowe, R.J. Davis, B. Forrest, D. Harris, H. Johnson; Associate Faculty: T.T. McKinney, M. Owen; Adjunct Faculty: M. Baker, D. Boone, E.J. Boone, J. Lansdale, J. Lee, D. Peasley, J. Sabella

Agricultural and Extension Education is a broad field of study and practice representing the blending of agricultural and behavioral sciences into educational programs for youth and adults. Agriculture impacts everyone's life in terms of food, water, air, clothing, homes and the quality of life. Central to the department's goals is the formal and non-formal teaching of problem-solving and learning skills for a lifetime of growing, evolving, and changing.

There are many professional opportunities that are available to people participating in departmental programs. Graduates have the choice to plan for teaching, administrative leadership and public relations positions in secondary schools, community colleges, Cooperative Extension, and universities and agribusinesses. Graduates are highly qualified in agricultural and extension education and career placement assistance is provided to all graduates.

Curricula

The Agricultural Education curriculum encompasses areas of study that will enable students to participate effectively in planning, promoting, and initiating educational programs in agriculture. The program leads to a Bachelor of Science degree and is designed to prepare teachers of agriculture for secondary schools and community and technical colleges. The demand for agricultural education teachers exceeds present supply in the Carolinas, Virginia, and throughout the nation.

The Extension Education/Extension Concentration curriculum is designed to prepare individuals for careers in the extension service. The program leads to a Bachelor of Science degree in Extension Education. Students are required to complete both classroom and laboratory studies on the NC State campus and a closely supervised practicum in the field. A full semester internship in an office or agriculture-related industry during the senior year is required.

The Extension Education/Communication Concentration curriculum is designed to prepare individuals for careers in professions related to communications in agriculture. The program leads to a Bachelor of Science degree in Extension Education. Students are required to complete both classroom and laboratory studies on the NC State campus and a closely supervised practicum in the field. A 45-hour field work experience in an agriculture industry during the sophomore year and a full-semester practicum experience in an agricultural-related industry during the senior year are required.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

Nelson Hall, Room 3350
phone: (919) 515-3107
website: www.ag-econ.ncsu.edu

J. A. Brandt, Head
E. A. Estes, Associate Head and Extension Leader
A. W. Oltmans, Undergraduate Coordinator
D. J. Flath, Graduate Coordinator

William Neal Reynolds Professors: B.K. Goodwin, M.L. Walden, M.K. Wohlgenant; Professors: J.A. Brandt, A.B. Brown, E.A. Estes, D.J. Flath, T.J. Grennes, M.C. Marra, M.A. Renkow, C.D. Safley, W.N. Thurman, T. Vukina, G.A. Wossink Adjunct Professor: J.B. Hunt, Jr.; Professors Emeriti: R.C. Brooks, G.A. Carlson, A.J. Coutu, L.E. Danielson, J.E. Easley, D.G. Harwood, Jr., D.M. Hoover, L.A. Ihnen, R.A. King, H.L. Liner, C.E. Moore, D.F. Neuman, T.E. Nichols, Jr., E.C. Pasour, Jr., G.R. Pugh, R.A. Schrimper, J.A. Seagraves, R.L. Simmons, W.L. Turner, C.R. Weathers, R.C. Wells, J.C. Williamson, Jr.; Associate Professors: G.A. Benson, P.L. Fackler, A. Inoue, A.W. Oltmans, D.J. Phaneuf, N.E. Piggott, K.D. Zering; Associate Professors Emeritus: J.G. Algood, R.S Boals, H.C. Gilliam, Jr., D.D. Robinson, P.S. Stone; Assistant Professors: I. Kandilov, R. von Haefen, X. Zheng; Assistant Professors Emeriti: J.C. Matthews, Jr., E.M. Stallings; Lecturers: M.L. Hendrickson, J.L. Phillips, J.S. Russ, H.A. Sampson, III; Adjunct Instructors: R.K. Campbell, J.M. Kuszaj, E. Weems; Extension Specialists: S.G. Bullen, T.A. Feitshans, L.S. Smutko, R.H. Usry, G. van der Hoven

The Department of Agricultural and Resource Economics serves agricultural, resource and related industries through its extension, research and teaching programs. Applying principles of economics, business, and related disciplines, these programs develop an understanding of contemporary economic and business problems and equip students with knowledge of business organization fundamentals and decision-making skills useful in the operation and management of business firms.

The department offers undergraduate programs leading to a Bachelor of Science degree in Agricultural Business Management. A concentration in biological sciences and business management is offered within the agricultural business management program. The department also offers concentrations within campus-wide degree programs: a natural resources economics and management concentration leading to a Bachelor of Science degree in Natural Resources (see natural resources curriculum) and an economic policy concentration leading to a Bachelor of Science degree in Environmental Sciences (see environmental sciences curriculum).

The Agricultural Business Management Program prepares graduates for management, marketing, sales, finance and related careers. The program has sufficient flexibility to provide more extensive course work in basic and applied science and math for those students desiring to prepare for advanced graduate study as well. The concentration in biological sciences/business management prepares graduates for management, marketing, and sales careers in fields such as biotechnology, pharmaceuticals, health care, environmental protection, food processing and finance dealing with biological issues. This concentration is designed to be an attractive option for students with a strong background and interest in science who seek alternatives to technical science careers.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

The growing number of specialized business firms producing and marketing services and products in agriculture, resource and life science-related industries has created an increasing demand for graduates trained in agriculture and biological sciences/business management, resource economics and management and environmental policy.

Employment opportunities include careers with companies in purchasing, processing, and marketing food, fiber and related products; firms producing and marketing production inputs (feed, equipment, chemicals, drugs, etc.) and services; banks; other financial and credit agencies; cooperatives; natural resources management units and consulting firms; and natural resources and environmental educational or regulatory agencies.

Many graduates pursue careers in research and education with various state and federal government agencies. These agencies include the Cooperative Extension Service, the Agricultural Research Service, the State Department of Agriculture and Consumer Services, Environmental and Natural Resources, the United States Department of Agriculture, and the Environmental Protection Agency.

Minor in Agricultural Business Management

The Department of Agricultural and Resource Economics offers a minor in Agricultural Business Management. This minor provides students an opportunity to learn basic concepts useful in many careers in agricultural business. A total of 15 hours of course work is required, including ARE 201, and four additional courses chosen from a list of selected courses in agricultural and resource economics and related business fields. Consult the Department of Agricultural and Resource Economics for specific information.

DEPARTMENT OF ANIMAL SCIENCE

Polk Hall, Room 123
website: www.cals.ncsu.edu/an_sci/home

R. L. McCraw, Head
J. A. Moore, Undergraduate Coordinator
C. E. Farin, Director of Graduate Programs
L. Whitlow, Department Extension Leader

Alumni Distinguished Professors: W.L. Flowers; William Neal Reynolds Professors: J. Odle; Alumni Distinguished Professors Serving as Administrators: K.L. Esbenshade; Professors: B.P. Alston-Mills, J.H. Eisemann, C.E. Farin, B.A. Hopkins, R.L. McCraw, W.E.M. Morrow, R.A. Mowrey, Jr., R.M. Petters, M.H. Poore, J.W. Spears, M.T. See, S.P. Washburn, L.W. Whitlow; Professors Serving as Administrators: L.S. Bull, R.G. Crickenberger; Adjunct Professor: W. O. Herring, T.A. Van Kempen; Professors Emeriti: T.C. Blalock, D.G. Braund, K.R. Butcher, E.B. Caruolo, J.C. Cornwell, WNR Professor Emeritus: G.J. Eisen, R.W. Harvey, W.L. Johnson, J.R. Jones, F.N. Knott, C.A. Lassiter, J.G. Lecce, B.T. McDaniel, J.J. McNeill, R.D. Mochrie, R.M. Myers, G.S. Parsons, J.W. Patterson, B.R. Poulton, A.H. Rakes, F.D. Sargent, J.C. Wilk, G.H. Wise, J.R. Woodard; Associate Professors: V. Fellner, G.B. Huntington, J.M. Luginbuhl, J.A. Moore, P.D. Siciliano, E. Van Heugten, C.S. Whisnant; Associate Professors Emeriti: E.U. Dillard, R.E. Lichtenwalner, J.J. McNeil; Assistant Professors: M.S. Ashwell, J.P. Cassady, M.E. Hockett, H.C. Liu, S.E. Pratt; Adjunct Professor: D.S. Casey; Lecturer: K.D. Ange; Extension Specialists: J.S. Clay, P.A. Dukas, B.R. Faris, G.R. Griffin, D.C. Miller, D.E. Pritchard, J. Turner, M.J. Yoder; Extension Specialists Emeriti: B.C. Allison, J.H. Gregory, J.W. Parker, R.W. Swain; Associate Members of the Faculty: G.W. Almond (Population Health and Pathobiolgy, College of Veterinary Medicine), G.A. Benson (Agricultural and Resource Economics); J.C. Burns (USDA); W.M. Hagler (Plant Pathology, Poultry Science); D.K. Larick (Graduate School); J. Piedrahita (Molecular Biomedical Sciences, College of Veterinary Medicine), M.D. Whitacre (Population Health and Pathobiology, College of Veterinary Medicine)

Animal Science is a broad field centered on the biology, production, management, and care of domestic animals. Animals have, throughout history, provided man with a major source of food, fiber, pleasure, and companionship. Undergraduate students study subjects related to various phases of animal science. Courses are offered in anatomy, physiology, nutrition, genetics, and management, and there are opportunities for the application of basic scientific training in the husbandry areas. Use of animals and animal specimens is critical to our educational program. To obtain full credit for Animal Science courses, students are required to participate in laboratory procedures involving animals and animal specimens. The Institutional Animal Care and Use Committee (IACUC) approve all activities with live animals. Many lectures also incorporate animals or animal specimens into the course. Options for course selection by each student make it possible for those with varying backgrounds and wide-ranging interests to become involved in stimulating and rewarding experiences.

Opportunities

Opportunities for animal scientists are boundless and the areas of emphasis are diverse. Animal science graduates are qualified for positions in a wide variety of areas such as: research and development at pharmaceutical and biotechnology companies; livestock, horse, or companion animal management; animal breeding and production; feed and animal healthcare product sales and service; livestock marketing; consulting; state and federal departments of agriculture; breed associations; educational and financial institutions; livestock, horse, and companion animal publications and other media; animal technical services; extension services; and public relations. Animal scientists can be found across the nation and around the world in all phases of production, research, sales, service, business, health, and education. Many students in pre-veterinary medicine obtain degrees in animal science, as do other preprofessional students including pre-medical and pre-dental. Students may elect graduates study, after which they will find opportunities in teaching, research, and extension. See listing of graduate degrees offered in the *Graduate Catalog*.

Curricula

The degree of Bachelor of Science with a major in animal science may be obtained under either the science or industry curricula offered in the College of Agriculture and Life Sciences. The science curriculum (SAS) is designed for students with interest in advanced study in disciplines such as physiology, nutrition, and genetics. Many students in pre-veterinary medicine are enrolled in this curriculum pursuing a Bachelor of Science Degree in Animal Science. The industry (IAS) curriculum is for students interested in entry into the animal industry or allied businesses. It offers flexibility in complementing animal science with business, economics, and applied science course work.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Animal Science

A minor in Animal Science is open to all interested baccalaureate students who are not majoring in Animal Science. This minor is appropriate for (but not limited to) students majoring in Agricultural Business Management, Agricultural Economics, Agricultural Education, Agronomy, Food Science, Poultry Science and Zoology. Students completing a minor in Animal Science will become familiar with animal production and with its related industries. The minor requires a minimum of 15 credit hours with a grade of "C-" or better, including Introduction to Animal Science, Animal Nutrition, and the student's choice of Animal Science elective courses. The program is flexible in order that students may emphasize the discipline or species of their interest.
See: www.ncsu.edu/advising_central/minors_desc/animal_sci.html.

DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING

David S. Weaver Laboratories, Room 100
phone: (919) 515-2694
website: www.bae.ncsu.edu

R.O. Evans, Jr., Head
T.M. Losordo, Department Extension Leader
D. H. Willits, Director of Graduate Programs
S. A. Hale, Undergraduate Coordinator

Distinguished University Professor and William Neal Reynolds Professor: R.W. Skaggs; Professors: D.B. Beasley, C.J. Bowers, Jr., M.D. Boyette, R.O. Evans, S.A. Hale, G.D. Jennings, T.M. Losordo, L.F. Stikeleather, P.W. Westerman, T.B. Whitaker (USDA), D.H. Willits; Adjunct Professors: L. Coats, L.M. Safely, Jr., S.S. Schiffman, L.F. Sykes; Professors Emeriti: C.G. Abrams, J.C. Barker, G.B. Blum, Jr., J.W. Dickens, L.B. Driggers, E.G Humphries, W.H. Johnson, G.J. Kriz, W.F. McClure, F.M. Richardson, R.P. Rohrbach, A.R. Rubin, R.E. Sneed, R.S. Sowell, C.W. Suggs, R.W. Watkins, E.H. Wiser, J.H. Young; Associate Professors: G.R. Baughman, J. Cheng, J.J. Classen, R.L. Huffman, G.T. Roberson; Extension Professor: J. Spooner; Extension Assistant Professor: M.R. Burchell; Assistant Professors: M.S. Chinn, G.L. Grabow, W.F. Hunt, S.B. Shah, R.R. Sharma, M.W. Veal, L. Wang, M. Youssef; Research Assistant Professor: G.M. Chescheir; Adjunct Assistant Professors: D. Amatya, S.K. Seymour; Extension Specialists: D. Delong, D.E. Line, J.M. Rice, R.L. Sherman; Associate Members of the Faculty: L. Cartee (Biomedical Engineering), C.R. Daubert (Food Science), B.E. Farkas (Food Science), A.E. Hassan (Forestry), P.L. Mente (Biomedical Engineering), S.C. Roe (Companion Animal & Special Species Medicine), K.P. Sandeep (Food Science), K.R. Swartzel (Food Science)

The Department of Biological and Agricultural Engineering offers two four-year undergraduate programs in Biological Engineering (BE) and in Agricultural and Environment Technology (AET). The BE curriculum includes concentrations in agricultural engineering, bioprocess engineering, and environmental engineering. All concentrations within the BE curriculum emphasize basic

science and engineering courses that provide a sound background for application of engineering principles to biological and agricultural problems. The AET combines an understanding of the agricultural, biological, and physical sciences with technology and economics so that the focus is on applying engineering principles to agricultural and environmental systems.

Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization. Scientific and engineering principles are applied: to analyze, understand and utilize mechanical properties of biological materials; to the conservation and management of soil and water resources; to the design of sensor-based instrumentation and control systems for biological and agricultural applications; to the design and development of machinery systems for all phases of agricultural and food production; to the design of structures and environmental control systems for housing animals, plant growth, and biological product storage; to the design and evaluation of ergonomic devices for human and animal applications; and to the development of improved systems for processing and marketing food and agricultural products.

Graduates of the BE curriculum receive a "B.S. in Biological Engineering," qualifying them for positions in design, development, and research in both industry and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Some positions filled by recent BE graduates include: product design; development and testing; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering analysis and inspection for federal and state agencies; engineering consultant and research. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The AET curriculum provides graduate opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum's flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.

Curricula

The BE curriculum is jointly administered by the College of Agriculture and Life Sciences and the College of Engineering and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21201-4012; phone: (410) 347-7700. BE graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements. Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

The program educational objectives of the Biological Engineering (BE) Bachelor of Science (B.S.) degree are to:

- Educate students for successful careers in engineering by mastering the fundamentals of engineering and biology.
- Instill in the students time management skills and a sense of confidence in their ability to grasp and apply engineering principles to solve complex, real-world problems.
- Impart a sense of professional responsibility and work ethic.
- Establish an educational environment in which students participate in interdisciplinary activities.
- Offer a curriculum that provides students an opportunity to become broadly educated engineers and life-long learners.
- Expose students to advances in engineering practice and research.
- Recruit students with high potential who will contribute to the future economic and social well-being of North Carolina.

The AET curriculum is administered by the College of Agriculture and Life Sciences and is intended to uniquely prepare students for hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both the production personnel as well as the designers and implementers of technological systems.

The program objectives of the Agricultural and Environmental Technology (AET) Bachelor of Science (B.S.) degree are to:

- Develop in students a contextual knowledge of physical and biological systems supporting agriculture and the environment.
- Develop a contextual knowledge of physical and biological systems supporting agriculture and the environment.
- Develop depth and/or breadth by choosing appropriate agricultural, environmental or business electives.
- Utilize hands-on approaches in the formulation of solutions to practical problems.
- Apply critical thinking and existing technology to identify, evaluate, and solve problems with agricultural and environmental systems.
- Communicate effectively between engineers, technicians, businesses, and consumers to gain information needed to solve and problem present solutions.
- Motivate students to engage in life-long learning.
- Work effectively in teams.

Minor in Agricultural and Environmental Technology

A minor is offered to students interested in the applicant of engineering technology analysis in agricultural and environmental systems that utilize machinery, agricultural structures, food and feed processing, soil, water and waste management, electrical power and controls, and agricultural safety and health technology. This minor is not open to AET majors and allows majors in other

programs to understand engineering technology for equipment, materials, resources, processes, and facilities utilized in their major area of study, and be knowledgeable in the application of technology for managing environmental issues, impacts, and monitoring.

DEPARTMENT OF PLANT BIOLOGY

Gardner Hall, Room 2115
phone: (919) 515-2727

M. E. Daub, Head
C. V. Jordan, Undergraduate Coordinator
R. S. Boston, Director of Graduate Programs

University Research Professor: W.F. Thompson; Alumni Distinguished Undergraduate Professors: R.L. Beckmann, T.R. Wentworth; William Neal Reynolds Distinguished Professors: W.F. Boss, R.S. Boston; Professors: N.S. Allen, R.L. Blanton, W.F. Boss, R.S. Boston, J.M. Burkholder, M.E. Daub, E. Davies, C.H. Haigler, N. Robertson, J.F. Thomas, T.R. Wentworth; Research Professor: C.S. Brown; Professors Emeriti: U. Blum, R.J. Downs, R.C. Fites, J.W. Hardin, R.L. Mott, G.R. Noggle, E.D. Seneca, J.R. Troyer, C.G. Van Dyke; Associate Professors: R.L. Beckmann, J.E. Mickle, J.M. Stucky, Q. Xiang; Assistant Professor: W.A. Hoffman, H.I.A Sederoff, D. Xie; Research Assistant Professor: I.Y. Perera; Teaching Assistant Professors: S.B. Carson, C.V. Jordan, B. Thakor; Teaching Technician: D.S. Wright; Associate Members of the Faculty: H.V. Amerson (Forestry), K.O. Burkey (USDA), S. Hu (Plant Pathology), J.M. Riddle (History), J.B. Ristaino (Plant Pathology), T.W. Rufty, Jr., (Crop Science), E.C. Sisler (Biochemistry), E.A. Wheeler (Wood and Paper Science), R.W. Whetten (Forestry)

The instructional program provides classroom, laboratory, and field experience in the major areas of plant science. Undergraduates majoring in plant biology are given a broad background in the humanities and physical sciences and are required to have a supervised research or teaching experience. Majors, as preprofessionals in the plant sciences, are prepared for advanced study in plant biology and other biological fields, as well as in the applied plant sciences, such as horticulture, crop science, plant pathology, resource management and environmental biology.

Opportunities

The undergraduate degree is an excellent preprofessional degree in the plant sciences. Many majors continue with graduate studies; see list of graduate degrees. After obtaining a graduate degree, the undergraduate major will be qualified for teaching positions in the community and junior colleges, colleges and universities, for research positions in federal and state government laboratories and in private industry. Research technician positions in many life science areas in governmental and industrial laboratories are also career possibilities. The field of biotechnology provides additional technical opportunities. Field botanists and naturalists find employment in state and national park systems and nature interpretation programs.

Curricula

The Bachelor of Science degree with a major in Plant Biology is offered under the science curriculum of the College of Agriculture and Life Sciences. The Bachelor of Science with double concentration- one in economics, English, history, philosophy, or political science, and the other in plant biology is available in the College of Humanities and Social Sciences. For details, refer to the appropriate section under the College of Humanities and Social Sciences.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Biotechnology

The Minor in Biotechnology provides first hand laboratory experience with a variety of technologies that use gene manipulation, recombinant organisms, or cell culture. The laboratory courses typically are started in the junior year, following completion of BIO 181 or ZO 160 and Organic Chemistry (CH 223) with a grade of C- or better. BIT 410, "Manipulation of Recombinant DNA" is required for all students but BCH 454 can be substituted. Other requirements for the minor include a 3 credit research internship, 4 credits of advanced biotechnology laboratory courses (BIT 460-495), and a biotechnology ethics course. Interested students should visit the website www.ncsu.edu/biotechnology, or contact Dr. Sue Carson at sue_carson@ncsu.edu for more information.

DEPARTMENT OF CROP SCIENCE

Williams Hall, Room 2205
phone: (919) 515-2647
website: www.cropsci.ncsu.edu

W.D. Smith, Interim Head
J. F. Spears, Undergraduate Coordinator
R. Wells, Director of Graduate Programs

Distinguished University Professor: M.M. Goodman; Alumni Distinguished Undergraduate Professor: R.P. Patterson; William Neal Reynolds Professors: M.M. Goodman, A.C. York; Philip Morris Professor: W.D. Smith; Professors: D.T. Bowman, A.H. Bruneau, J.C. Burns (USDA), J.W. Burton (USDA), T.E. Carter, Jr. (USDA), R.J. Cooper, R.E. Dewey, E.J. Dunphy, K.L. Edmisten, E.L. Fiscus (USDA), T.G. Isleib, C.H. Haigler, R.W. Heiniger, D.S. Marshall (USDA), G.L. Miller, J.P. Mueller, J.P. Murphy, C.H. Peacock, R.C. Rufty, T.W. Rufty, Jr., H.T. Stalker, J.F. Spears, A.K. Weissinger, R. Wells, J. Wilcut, P.R. Weisz,

F.H. Yelverton, R. Wells, G.G. Wilkerson, J.C. Wynne; Adjunct Professors: J.R. Evans, S.C. Huber (USDA), K.D. Getsinger, D.G. Oblinger, D.T. Patterson, J.A. Ryals, T. Sinclair, D.C. Drehmel, G.M. Werner; Professors Emeriti: C.T. Blake, C.A. Brim, D.S. Chamblee, H.D. Coble, W.K. Collins, W.A. Cope, F.T. Corbin, D.A. Emery, W.T. Fike, W.B. Gilbert, W.C. Gregory, H.D. Gross, G.R. Gwynn, S.N. Hawks, R.E. Jarrett, G.L. Jones, G.C. Klingman, J.A. Lee, W.H. Lewis, D.E. Moreland, G.F. Peedin, L.L. Phillips, H. Seltman, G.A. Sullivan, D.L. Thompson, D.H. Timothy, A.D. Worsham; Associate Professors: D.C. Bowman, F.L. Booker (USDA), G. Brown-Guidera, K.O. Burkey (USDA), D.A. Danehower, D.L. Jordan, J.M. Luginbuhl, R. Qu, J.B. Holland, P. Kwanyuen (USDA), D.P. Livingston (USDA); Associate Professors Emeriti: R.L. Davis, W.G. Toomey; Assistant Professors: M.G. Burton, A.J. Cardinal, L.R. Fisher, J.L. Nicholson, R.J. Richardson, S.C. Reberg-Horton; Adjunct Assistant Professor: M. Fraser; Associate Members of the Faculty: R.L. Beckmann (Biological Sciences), P. Balint-Kurti (Plant Pathology), M. Feaver (Zoology), W. Grant (Zoology), J. Mickle (Biological Sciences), L. Parks (Lecturer), C.W. Stuber (Genetics), W.F. Thomson, C.T. Young (Food Science); Research Assistant Professor: S. M. Weissinger.

Crop Science is the discipline of producing abundant, safe and sustainable food, feed, fiber, and fuel crops and enhancing the quality of recreational and ornamental turgfrass. The Department of Crop Science offers two areas of study: Agronomy and Turfgrass Science. Undergraduate students in both curricula study adaptation, production practices, sustainability, genetics, pest management, soil management and soil fertility associated with producing various commodities. The Agronomy curriculum offers concentrations in science, crop production, business and soil science. These concentration options allow students with diverse backgrounds and career goals to select courses that meet their individual needs.

Opportunities

There are numerous career opportunities for Agronomy and Turfgrass Science graduates. Many of our Agronomy science-option graduates enroll in graduate programs here at NCSU or at major universities throughout the country. Others find employment as research specialists with companies engaged in plant improvement, genetic enhancement of plant traits, and agri-chemical development. Agronomy technical and business option graduates often secure jobs as consultants, extension agents, farm managers, seed production specialists, agribusiness agronomists and managers, soil survey specialists, soil conservationists, technical sales representatives, and waste management specialists. Graduates from our Turfgrass Science program find employment as golf course superintendents, athletic field managers, home and recreational lawn professionals, and turfgrass sod producers.

Curricula

Students may earn a Bachelor of Science degree in Turfgrass Science (TFG) or a Bachelor of Science degree in Agronomy with concentrations in Agronomic Science (TAA), Crop Production (TAC), Agronomic Business (TAB), or Soil Science (TSS). The Agronomy curriculum is administered jointly by the Departments of Crop Science and Soil Science.

Minor in Crop Science

The Crop Science Minor is open to any degree seeking undergraduate student interested in gaining knowledge of the development, productivity and sustainability of crop management systems, genetic improvement and pest management strategies, and the interaction of crops with their physical and biotic environment. It is intended to complement other curricula that are related to crop-environment and agro-ecological studies. An appreciation of agronomic approaches, which lead to a more efficient use of crop production inputs and to a less invasive impact on the environment, is emphasized. It is not intended to prepare students for a professional career in Crop Science. Additional courses are recommended for students who plan graduate work in this discipline.

Minor in Agroecology

The Agroecology minor is open to all baccalaureate students. It is designed for students majoring in the biological sciences, agronomy, horticulture and animal sciences, but will be of interest to a wide array of students as agriculture has broad implications in the life sciences, economics, and sociology. Agroecology instruction provides students a fundamental understanding of agriculture and its interaction with natural and social systems. Students selecting the Agroecology minor will gain an understanding of modern production agriculture from an ecological and sociological perspective, obtain new skills in analyzing agricultural systems, and acquire the knowledge to design a plan for change. This knowledge will improve a student's ability to work with agricultural professionals to implement a system that meets ecological and social needs while remaining profitable for farmers.

DEPARTMENT OF ENTOMOLOGY

Gardner Hall, Room 2301
phone: (919) 515-2746
website: www.cals.ncsu.edu/entomology

J. D. Harper, Head
J. R. Meyer, Undergraduate Coordinator
F. P. Hain, Director of Graduate Programs
J. S. Bacheler, Department Extension Leader

Phillip Morris Professors: J.W. Van Duyn; William Neal Reynolds Professor: C.S. Apperson, F.L. Gould, G.G. Kennedy, R.M. Roe; Blanton J. Whitmire Professor: C. Schal; Charles G. Wright Professor: J. Silverman; Professors: J.T. Ambrose, J.S. Bacheler, J.R. Bradley, Jr., R.L. Brandenberg, F.P. Hain, J.D. Harper, J.R. Meyer, R.E. Stinner, J.F. Walgenbach, B.M. Weigmann; Adjunct Professors: J.J. Arends, A.C. Cohen, G. Gordh, D.M. Jackson, N.M. Hamon, D.E. Sonenshine; Professors Emeriti: R.C. Axtell,

J.R. Baker, W.M. Brooks, W.V. Campbell, L. Dietz, M.H. Farrier, R.J. Kuhr, H.B. Moore, Jr., H.H. Neunzig, R.L. Robertson, K.A. Sorenson, P.S. Southern, C.G. Wright; Associate Professors: D.B. Orr, C.E. Sorenson, D.W. Watson, E.L. Vargo; Adjunct Associate Professors: S. Bloem, A.K. Dowdy, K.S. Hedlund, D.E. Herbert, K.R. Lakin, C. Nalepa, R. Sequiera, J.W. Smith; Associate Professor Emeritus: R.C. Hillman; Assistant Professors: C.A. Casey, C.M. Grozinger, D.R. Tarpy; Adjunct Assistant Professors: C. Devorshak; Extension Assistant Professor: M.G. Waldvogel; Research Assistant Professor: A.T. Groot; Extension Specialists: S.B. Bambara, D.L. Stephan, S.M. Stringham, S.J. Toth; Associate Members of the Department: Associate Professors: W.G. Buhler (Horticulture), D.J. Robison (Forestry)

Undergraduate instruction in entomology provides introductory and advanced courses in the basic science of entomology and the management of beneficial and pest insects. Courses at the 200- and 400-level fulfill General Education Requirements in Natural Sciences or Science and Technology and serve students majoring in biological sciences, agronomy, horticultural science, agricultural education, crop science, forestry and plant biology. They also provide fundamental training for graduate study in entomology (see the *Graduate Catalog*).

Opportunities

For graduates with advanced degrees in entomology, opportunities include research, teaching, and extension positions in colleges and universities; research, development, production, control, and sales positions in private industries; consultative positions in pest management; curatorial positions in museums; and research and regulatory positions with state and federal agencies.

Curricula

There is no entomology undergraduate major. Those students with a primary interest in entomology are advised to choose a general biological science curricula and the minor in entomology.

Minor in Entomology

The Department of Entomology offers an undergraduate minor available to all baccalaureate degree students at North Carolina State University. The minor is especially appropriate for (but not limited to) students interested in biological or agricultural sciences, veterinary medicine, or other health sciences. A basic knowledge of insect biology may also be useful to students seeking careers in government, industry, or education. The minor consists of a minimum of 15 credit hours, including one core course (ENT 402 or ENT 425). The remaining hours can be selected from a group of restricted electives.

DEPARTMENT OF ENVIRONMENTAL AND MOLECULAR TOXICOLOGY

Toxicology Building, Centennial Campus
phone: (919) 515-2274
website: www.tox.ncsu.edu

G. LeBlanc, Interim Department Head
C. S. Hofelt, Undergraduate Coordinator
R. C. Smart, Director of Graduate Programs
W. G. Cope, Department Extension Leader

William Neal Reynolds Professor (emeritus): E. Hodgson; Professors: G.A. LeBlanc, D. Shea, R.C. Smart; Professors Emeriti: T.J. Sheets, R.B. Leidy; Associate Professors: W.G. Cope, Research Associate Professor: N. Deighton; Assistant Professors: D.B. Buchwalter, J. Tsuji, Y. Tsuji, A.D. Wallace; Research Assistant Professor: P.D. McClellan-Green; Teaching Assistant Professor: C.S. Hofelt; Associate Members of the Program: Professors: K.B. Adler, J.M. Cullen, H.M. Hassan, S.M. Laster, N.A. Monteiro-Riviere, R.M. Roe, P.L. Sannes, M.K. Stoskopf; Associate Professors: R.E. Baynes J.M. Horowitz, M. Hyman, J.M. Law Assistant Professors: E. Guthrie Nichols, M.L. Rodriguez-Puebla

Toxicology is the science dealing with how chemicals and physical agents cause adverse effects on living organisms and environmental systems. This includes understanding where chemicals come from, what happens to them in the environment, how people and ecosystems are exposed to chemicals, and the cascade of events that take place following chemical exposure to cause adverse effects. Toxicology is an interdisciplinary field of study that integrates many physical, chemical, and biological principles that help us better protect human and ecological health.

Opportunities

Students who participate in our undergraduate program will gain the scientific background and skills required for employment in environmental and biomedical careers with university, industrial, state, and federal research laboratories and regulatory agencies. The curriculum is especially suited to students preparing for graduate study in environmental sciences, biochemistry, molecular biology, biotechnology, and genetics and for the health fields of medicine, veterinary science, pharmacology and related fields.

Curricula

The Department of Environmental and Molecular Toxicology offers an undergraduate minor in Environmental Toxicology that is available to all baccalaureate degree students at North Carolina State University. The minor is intended to provide undergraduate students with an understanding of how chemicals and physical agents can adversely affect biological systems and the environment, including the mechanisms of chemically induced toxicity, the fate and effects of chemicals in the environment, and the evaluation of

chemical hazards and risks. The minor is especially appropriate for (but not limited to) students majoring in the biological or agricultural sciences, physical sciences or science education. For additional information on course, curriculum, and research opportunities please visit our website at www.tox.ncsu.edu or contact Undergraduate Coordinator Dr. Chris Hofelt at c_hofelt@ncsu.edu.

DEPARTMENT OF FOOD SCIENCE

Schaub Hall
phone: (919) 515-2951
website: www.ncsu.edu/foodscience

D. R. Ward, Department Head
B.E. Farkas, Associate Department Head
J. E. Rushing, Department Extension Leader
L. G. Turner, Food Science Undergraduate Teaching Coordinator
C.R. Daubert, Bioprocessing Science, Undergraduate Teaching Coordinator
S. L. Ash, Nutrition Undergraduate Coordinator
J. C. Allen, Director of Graduate Programs

Distinguished University Professor: T.R. Klaenhammer; William Neal Reynolds Professors: E.A. Foegeding, K.R. Swartzel; Professors: J.C. Allen, L.C. Boyd, D.E. Carroll, Jr., G.L. Catignani, Jr., B.E. Farkas, D.P. Green, L.A. Jaykus, T.C. Lanier, D.K. Larick, R.F. McFeeters (USDA), J.L. Oblinger, J.E. Rushing, T.H. Sanders (USDA), J.D. Sheppard, L.G. Turner, D.R. Ward; Associate Professors: S. L. Ash, F. Breidt (USDA), C.R. Daubert, M.A. Drake, S. Kathariou, K.P. Sandeep; Assistant Professors, A. Amézquita, F.M. Arritt, D.J. Hanson, T. Phister, D. Truong (USDA); Professors Emeriti: L.W. Aurand, H.R. Ball, T.A. Bell, R.E. Carawan, J.A. Christian, H.B. Craig, H.P. Fleming, M.E. Gregory, A.P. Hansen, M.W. Hoover, V.A. Jones, D.H. Pilkington, S.J. Schwartz, H.E. Swaisgood, F.B. Thomas, W.M. Walter, Jr.; Associate Members of the Faculty: K.E. Anderson (Poultry Science), A.M. Fraser (Family and Consumer Sciences), S.A. Hale (Biological and Agricultural Engineering), H.M. Hassan (Biochemistry, Microbiology, Toxicology), T.J. Hoban (Sociology and Anthropology), S.A. Khan (Chemical Engineering), C.J. Lackey (Family and Consumer Sciences), R. Sharma (Biological and Agricultural Engineering), B.W. Sheldon (Poultry Science); Adjunct Professors: P.A. Curtis, A. Kilara, M. Mohamadzadeh, Y. Pan, R.C. Theuer.

The Department of Food Science offers three undergraduate degree programs; Food Science, Bioprocessing Science and Nutrition Science. These programs focus on the application and integration of chemistry, biology, biochemistry, biotechnology, and engineering disciplines on the development, production, and delivery of safe and nutritious foods and other products from bioprocessing operations. In support of each program, the department maintains modern and fully-equipped laboratories for teaching and research. All three undergraduate programs are compatible with pre-professional school curricula, such as pre-med or pre-vet, and many students elect to minor or double major in Biochemistry, Biological and Agricultural Engineering, Chemical and Biomolecular Engineering, Poultry Science, Animal Science, or other curricula.

Opportunities

Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products creates a variety of career opportunities in the food, pharmaceutical and allied industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

Many career opportunities exist in the food and beverage industry, the world's largest manufacturing sector, for graduates with a Food Science degree. Food science professionals are involved in the discovery of new food sources, new methods of food preservation, or product development. Positions are found worldwide, providing technical support to the food and beverage industry and government agencies. Food scientists work to ensure the safety and quality of foods through application of basic scientific principles. The demand for food scientists continue to increase as the food industry expands.

The Bioprocessing Science degree is a unique program designed to provide graduates with a special skill set specific in bioprocessing and biomanufacturing. Graduates from this degree program will have exciting opportunities to biomanufacture medicines, vaccines, enzymes and other products that improve the quality of life.

Jobs for those with training in Nutrition Science are increasing due to the growing and aging population, public interest, especially related to obesity and chronic disease risk, and a desire to develop nutritious products for a health conscious consumer. Nutrition scientists many be employed in a variety of settings including clinical or private practice, health management organizations, wellness centers, health-related government agencies or non-profit organizations, and the food industry. Because of the key role that diet plays in the prevention, development, and treatment of many major diseases, health professionals benefit from an understanding of nutrition. Therefore, a degree in Nutrition Science is also highly relevant for those desiring a career in an allied health field.

The Department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Sciences.

Curricula

The Food Science Bachelor of Science degree is offered through two curricula emphasizing science or technology. The science curriculum is designed for students desiring a more analytically intense program leading to technical careers in the food industry or

graduate school. Students with an interest in business opportunities will find the Technology program permits greater flexibility for students to pursue coursework in business, agricultural economics, or related fields.

The Bioprocessing Science Bachelor of Science degree prepares students for technical careers in biomanufacturing through formal training in fundamental sciences, as well as preparing students for careers in industries whose products are based on biological systems, including biopharmaceutical and biotechnology companies.

The Nutrition Science Bachelor of Science degree is designed for those students with an interest in graduate school or for those going on to post graduate training in an allied human health profession.

Minor in Food Science

The Food Science Minor is designed to provide students with important food science principles and concepts, giving a competitive edge to individuals seeking employment in the food, pharmaceutical and related industries. A minor provides technical information to improve the student's knowledge and understanding of food and its manufacture. While a comprehensive coverage of Food Science cannot be accomplished in 15 credit hours, flexibility in developing the minor permits tailoring each program to complement a student's major. An introductory course (FS 201) is required, but other courses are selected to build on the student's major.

Minor in Nutrition

A Nutrition Science minor is designed to provide knowledge of the principles of nutrition needed to formulate balanced diets and to apply an understanding of nutrient structure, function, and sources to the evaluation of information and policies concerning foods and dietary and/or feeding practices. Introductory Biochemistry and a sophomore seminar are required courses; students then select an additional 11 credit hours from a list of 200-500 level classes, including on and off-campus independent study or research experiences.

Specific curriculum requirements for all programs are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF GENETICS

Gardner Hall, Room 3513
phone: (919) 515-2292
website: www.cals.ncsu.edu/genetics

S. E. Curtis, Head and Director of Graduate Programs
W. H. McKenzie, Undergraduate Coordinator and Undergraduate Minor Administrator

Alumni Distinguished Undergraduate Professors: T.H. Emigh, W.H. McKenzie; Distinguished University Professor: T.F.C. Mackay; William Neal Reynolds Professors: W.R. Atchley, G.C. Gibson, T.F.C. Mackay, S.B. Zeng; Professors: S.E. Curtis, S.L. Spiker, J.L. Thorne; Adjunct Professor: M.D. Chilton; Professors Emeriti: W.D. Hanson, W.E. Kloos, C.S. Levings, D.F. Matzinger, J.G. Scandalios, H.E. Schaffer, R.H. Moll, C.W. Stuber, A.C. Triantaphyllou; Associate Professors: T.H. Emigh, J.W. Mahaffey, W.O. McMillan,; Adjunct Associate Professor: M.A. Conkling; Assistant Professors: J. Alonso, P. Awadalla, P. Estes, R. Franks, M. Gardner, L. Mathies; Assistant Adjunct Professors: P. Hurban, S.J. Uknes; Associate Members of the Faculty: R.R.H. Anholt (Zoology), L. Hanley-Bowdoin (Molecular and Structural Biochemistry), R.S. Boston (Plant Biology), R.A. Dean (Plant Pathology), M.M. Goodman (Crop Science), F. Gould (Entomology), C. Grozinger (Entomology), T.R. Klaenhammer (Food Science) S.A. Lommel (Plant Pathology), R.R. Sederoff (Forestry), C.H. Opperman (Plant Pathology), D. Robertson (Plant Biology), W.F. Thompson (Plant Biology)

The Department of Genetics offers courses at the advanced undergraduate and graduate levels. Undergraduate students interested in genetics are encouraged to pursue a genetics minor (see below) in conjunction with a major in one the basic biological or agricultural sciences. An undergraduate major in genetics is not available. The graduate program is designed to train scientists for research and teaching careers in genetics and molecular biology. Please refer to the *Graduate Catalog* for further information concerning the M.S. and Ph.D. degrees in genetics and the Master of Genetics degree.

Minor in Genetics

The Department of Genetics offers an undergraduate minor in genetics to provide students with strong preparation in the principles of genetics as well as preparation in ancillary fields such as statistics, biochemistry and microbiology. This minor is appropriate for (but not limited to) students with majors in agronomy, animal science, biochemistry, biological sciences, crop science, environmental sciences, fisheries and wildlife sciences, food science, forestry, horticultural science, medical technology, microbiology, plant biology, poultry science, and zoology. The genetics minor requires 18 hours— 15 specified and 3 elective. A grade of "C" or better is required for all courses to fulfill the genetics minor requirements.

DEPARTMENT OF HORTICULTURAL SCIENCE

Kilgore Hall, Room 120
phone: (919) 515-3131
website: www.cals.ncsu.edu/hort_sci

J. L. Kornegay, Department Head
D. W. Monks, Assistant Department Head
B. H. Lane, Undergraduate Coordinator
J. M. Dole, Director of Graduate Programs
J. R. Schultheis, Department Extension Leader
D. J. Werner, Director, JC Raulston Aboretum

Alumni Distinguished Undergraduate Professor: B.H. Lane; Alumni Distinguished Graduate Professor: F.A. Blazich; Professors: J.R. Ballington, Jr., T.E. Bilderback, F.A. Blazich, S.D. Clouse, N.G. Creamer, J.M. Dole, P.R. Fantz, W.C. Fonteno, R.G. Gardner, L.E. Hinesley, W.E. Hooker, J.L. Kornegay, D.W. Monks, J.C. Neal, P.V. Nelson, M.M. Peet, E.B. Poling, T.G. Ranney, J.R. Schultheis, S.E. Spayd, S.L. Warren, T.C. Wehner, D.J. Werner, L.G. Wilson; Faculty Emeriti: W.E. Ballinger, L. Bass, J.R. Brooks, Jr., A.A. De Hertogh, J.H. Harris, W.R. Henderson, G.R. Hughes, T.R. Konsler, C.M. Mainland, C.H. Miller, T.J. Monaco, D.M. Pharr, M.A. Powell, W.A. Skroch, C.R. Unrath, J.H. Wilson, Jr.; Adjunct Professors: R.L. Sawyer, P.S. Zorner; Associate Professors: W.G. Buhler, J.D. Burton, J.M. Davis, G.E. Fernandez, S.J. McArtney, M.L. Parker, B.R. Sosinski, B.E. Whipker, J.D. Williamson, G.C. Yencho; Assistant Professors: L.K. Bradley, A.V. LeBude, P.A. Lindsey, A.M. Spafford; Adjunct Assistant Professor: C.E. Niedziela, F.R. Walls, F.C. Wise; Lecturer: H.T. Kraus, B.H. Lane; Research Assistant Professor: G.C. Allen, II, K.M. Jennings; Researchers: R.B. Batts, M.E. Clough, K.V. Pecota; Extension Associates: E.A. Driscoll, E.D. Evans, C.L. Fisk, W.R. Jester, W.E. Mitchem, A.C. Thornton; Associate Members of the Faculty: M.D. Boyette (Biological and Agricultural Engineering), G.E. Hoyt (Soil Science), F.H. Yelverton (Crop Science)

Horticulture is a dynamic segment of agriculture. The development, growth, distribution, and utilization of fruits, vegetables, flowers, and ornamental plants plus the arts of floral design and landscaping enriches our lives with nutritious foods and more attractive surroundings. North Carolina's varied climatic conditions favor the production of a wide variety of horticultural crops on a commercial scale, as is the development of parks and gardens. The population and amount of industry in the state are increasing, and with them the use of ornamental plants. Designers skilled in residential and commercial landscaping, interior plantscaping, and plant maintenance are in high demand. This has created an increased demand for plants and information about gardening by the consumer.

Undergraduate programs in horticultural science offer a broad based education in physical and biological sciences and a sound cultural background. Students can concentrate in areas of fruit and vegetable science, floriculture, woody ornamental plant science, landscape design, or pursue a general approach encompassing all the specialties. They are prepared for graduate study or for diverse professional service.

Opportunities

Horticulture graduates fill positions in production, processing, sales and service. Among these are county extension agents; vocational agriculture teachers; landscape designers, landscape contractors; farm operators; orchard, nursery, greenhouse, and garden center managers; research, production and promotional specialists with commercial seed, floral fertilizer, chemical and food companies; inspectors and quality control technologists; USDA specialists and leaders in other phases of agricultural and industrial developments. Students may also prepare for careers in research, teaching or extension in horticulture.

Curricula

The degree of Bachelor of Science with a major in horticultural science can be earned in either science or technology. Under the science curriculum, specialized education is offered in fruit and vegetable crops, floriculture, and ornamental horticulture. Under the technology curriculum, education is offered in landscape design or in a general approach, which allows for specialization.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Horticultural Science

The academic minor in Horticultural Science is offered to students who desire a strong foundation in the principles of horticultural science. Students may choose to enhance their own major by selecting courses in a specialized area of horticulture such as fruits and vegetables, ornamentals, floriculture, or landscape horticulture, or they may pursue a more general approach to the entire field of study. Sixteen or seventeen credit hours are required for the minor, depending on courses selected.

DEPARTMENT OF MICROBIOLOGY

Gardner Hall, Room 4510
phone: (919) 515-2391
website: www.microbiology.ncsu.edu

G. H. Luginbuhl, Interim Head and Undergraduate Coordinator
M. R. Hyman, Director of Graduate Programs

Professors: M. Flickinger, H.M. Hassan, S. Laster, J.M. Mackenzie, E. Miller, I Petty; Professor Emeriti: P.E. Bishop (USDA), W.J. Dobrogosz, G. H. Elkan, L.W. Parks, J.J. Perry; Adjunct Professors: B. Adkins, J. Heller, S.R. Tove; Associate Professors: J.W. Brown, A. Grunden, M.R. Hyman; Adjunct Associate Professors: J. Caplan, J.M. Ligon, S. Shore, E. G. Smith, J. Stephenson; Assistant Professor: L. Hamer, J.W. Olson, F. Scholle, M.L. Sikes; Teaching Assistant Professor: M. Keen; Research Assistant Professor: Jose. Bruno-Barcena; Adjunct Assistant Professors: J. Bundy, W. Casey, M. Strand; Teaching Technician: V.M. Knowlton; Lab Supervisor: T.J. Schneeweis; Associate Members of the Faculty: P. Arasu (Veterinary Medicine), F. Breidt (Food Science), D.T. Brown (Biochemistry), F.J. Fuller (Veterinary Medicine), L. Jaykus (Food Science), S. Kathariou (Food Science), R. Kelly (Chemical Engineering), T.R. Klaenhammer (Food Science), P.E. Orndorff (Veterinary Medicine), B. Sherry (Veterinary Medicine), J.C.H. Shih (Poultry Science), R.G. Upchurch (Plant Pathology)

The microbiology program provides basic preparation in microbiology, virology, and immunology for professional microbiologists and students in other sciences and an awareness of the microbial world as it relates to our daily lives for non-science majors.

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics, and other aspects of the life process of an array of microscopic, generally single-celled, organisms and viruses. These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced the spectacular advances in biology and genomic science during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human and animal health will rely heavily on understanding microbial processes.

Opportunities

Microbiologists are employed in university, governmental and industrial research laboratories, diagnostic, environmental and quality control laboratories, teaching, and technical sales and service positions.

Curricula

The microbiology curriculum leads to a Bachelor of Science degree and is designed to provide the student with a strong foundation in mathematics, chemistry, and physics, and skills in oral and written communication. The student will also gain broad general knowledge of molecular and cellular biology as well as a foundation in the basic areas of microbiology, virology, and immunology. Graduates of this curriculum will be prepared for work in research laboratories and production facilities or for further study in graduate and professional schools such as Medical and Dental schools.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Microbiology

The Department of Microbiology offers an undergraduate minor available to all baccalaureate degree students at North Carolina State University who are not majoring in microbiology. The minor is especially appropriate for (but not limited to) students majoring in the biological or agricultural sciences, physical sciences, or science education. The minor requires 15 semester hours including 8 hours of required courses and 7 hours from a group of restricted electives. Any prerequisite courses are in addition to these courses. A grade of C or better is required for all courses taken to fulfill the minor requirements.

DEPARTMENT OF MOLECULAR AND STRUCTURAL BIOCHEMISTRY

Polk Hall, Room 128
phone: (919) 515-2581
website: biochem.ncsu.edu

D. T. Brown, Head
E. S. Maxwell, Assistant Department Head and Director of Graduate Programs
J. A. Knopp, Undergraduate Coordinator

William Neal Reynolds Professor: W.L. Miller; Professors: P.F. Agris, J. Cavanagh, L.K. Hanley-Bowdoin, C.L. Hemenway, E.S. Maxwell, E.C. Sisler, P.L. Wollenzien; Adjunct Professors: K.S. Korach, M. Luther, J.D. Otvos, E.C. Theil; Professors Emeriti: F.B. Armstrong, H.R. Horton, J.S. Kahn, I.S. Longmuir; Associate Professors: C.C. Hardin, J.A. Knopp; Assistant Professors: A.C. Clark, M.B. Goshe, C. Mattos, R.B. Rose; Visiting Assistant Professors: D.G. Presutti; Research Assistant Professor: H.S. Gracz; Associate Members of the Faculty: S. Franzen (Chemistry), H.M. Hassan (Microbiology), J. Horowitz (Veterinary Medicine), J.W. Moyer (Plant Pathology), D.E. Sayers (Physics), R.R. Sederoff (Forestry, Genetics); Lecturer: A. Sylvia

Biochemistry is the science which is concerned with the discovery and understanding of the chemical principles of life. It is a wide-ranging field from the composition, biosynthesis, structure and function of biomolecules to the control and regulation of biochemical processes within organelles, cells, organs and organisms. Biochemical principles form the basis of most laboratory procedures within the life cycle.

Opportunities

The Biochemistry program provides B.S. graduates with the scientific background and skills required for employment in biochemistry, molecular biology, biotechnology, and genetics and for the health fields of medicine, veterinary science pharmacology, and related fields.

Awards

The H. Robert Horton Award is given to the outstanding student in Biochemistry based on scholarly and research achievements as selected by the Biochemistry graduate students.

Honors

The honors program in Biochemistry is jointly administered within the College of Agriculture and Life Sciences and the College of Physical and Mathematical Sciences. It is designed for students who wish to explore advanced courses and be rewarded for outstanding academic achievement.

To be admitted to the honors program, a student must complete the three-semester sequence of Calculus (MA 141, 241, 242) and the calculus based Physics sequence (PY 205 and 208). Exceptions can be made for transfer students. Students with a GPA of at least 3.5 are invited into the program in their junior year. To complete the program, a student must take two semesters of Physical Chemistry sequence (CH 431 and 433), at least three hours of research and six hours of advanced or honors courses at the 300- or 400-level. Interested students should contact the Undergraduate Coordinator of Biochemistry for more detailed information.

Curricula

The curriculum emphasizes the fundamentals of biological and physical sciences, offering students both breadth of knowledge and depth of understanding. It is designed to provide students with broad experience in biological and chemical sciences and to encourage the development of experimental skills. One important aspect is the requirement of at least one semester experience in a Biochemistry laboratory. Because of the breadth of the course requirements, many students can easily add a second major in Biological Sciences, Chemistry, or other science as well as add a minor in Genetics.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF PLANT PATHOLOGY

Gardner Hall, Room 3419
phone: (919) 515-2730
website: www.cals.ncsu.edu/plantpath

J. W. Moyer, Department Head
T. B. Suton, Departmental Extension Leader
D. F. Ritchie, Director of Graduate Programs
L. F. Grand, Undergraduate Coordinator

Professors: D.M. Benson, D.M. Bird, R.I. Bruck, M.E. Daub (Head, Department of Plant Biology), E.L. Davis, R.A. Dean (William Neal Reynolds Distinguished Professor), L.F. Grand, S. Leath (Associate Dean, Director NC Agricultural Research Service), S.A. Lommel (Assistant Vice Chancellor for Research), D.S. Marshall (USDA-ARS, Research Leader), T.A. Melton (Phillip J. Morris Professor, Associate State Program Leader, ANR/CRD), J.W. Moyer, C.H. Opperman, G.A. Payne (William Neal Reynolds Distinguished Professor), J.B. Ristaino, D.F. Ritchie, H.D. Shew, T.B. Sutton; Professors Emeriti: J.L. Apple, C.W. Averre, III, R. Aycock, K.R. Barker, O.W. Barnett, Jr., D.F. Bateman (Dean Emeritus), M.K. Beute, G.V. Gooding, Jr., A.S. Heagle (USDA), R.K. Jones, A. Kelman (University Distinguished Scholar), C.E. Main, R.D. Milholland, N.T. Powell, R.A. Reinert (USDA), J.P. Ross, P.B. Shoemaker (Philip J. Morris Professor), H.W. Spurr, Jr., (USDA), D.L. Strider, H.H. Triantaphyllou, J.C. Wells, N.N. Winstead; Associate Professors:, M.A. Cubeta, G.J. Holmes, S. Hu, F.J. Louws, R.G. Upchurch (USDA-ARS), P. Veronese; Assistant Professors: P.J. Balint-Kurti (USDA-ARS), I. Carbone, C. Cowger (USDA-ARS), K.L. Ivors, A.L. Mila, L.P. Tredway, C.Y. Warfield; Research Assistant Professors: S.R. Koenning, T.K. Mitchell, B.B. Shew; Researcher and Extension Specialist: W.O. Cline; Senior Researcher, (Director, Micropropagation Unit): Z. Pesic-VanEsbroeck; Extension Specialist, (Director, Plant Disease and Insect Clinic): T.C. Creswell; Researcher, (Director, Plant Pathogen Identification Laboratory): Z.G. Abad; Adjunct and Associate Members of the Faculty: P.H. Berger (USDA-APHIS), L.G. Brown (USDA-APHIS), E.B. Cowling (University Distinguished Professor-at-Large), C. Devorshak (USDA-APHIS), J.L. Imbriani (NCDA), D.T. Kaplan (USDA-APHIS), M.D. Law (BASF), Yong-Hwan Lee (Seoul National University), S.C. Redlin (USDA-APHIS), S. Spencer (NCDA), V. Subbiah (PhytoMyco Research)

Undergraduate instruction in plant pathology is designed to provide introductory and advanced courses on the biology of plant pathogens and the nature and control of plant diseases to students majoring in crop science, horticultural science, the life sciences, and forestry. It also provides fundamental training necessary for graduate study in plant pathology and related fields. Thanks to the generosity of Dr. Arthur and Mrs. Helen Kelman, family and friends, the department offers the S.E. Kelman Memorial Scholarship to one or more outstanding undergraduates enrolled either in the College of Agriculture and Life Sciences, or the College of Natural Resources. Selected applicants will gain research experience as interns working under the supervision of a faculty member in the Department of Plant Pathology. For details of this scholarship program, consult www.cals.ncsu.edu/plantpath/activities/awards/kelman.

Opportunities

Employment in research, extension and teaching is available to graduates with advanced degrees in plant pathology. Research openings are typically with the U.S. Department of Agriculture, universities state experiment stations, industry and private

consulting. The rapid development of biotechnology, and the regulatory sciences, agricultural chemicals, other methods for disease control offer numerous opportunities for fulfilling careers in this field of study.

DEPARTMENT OF POULTRY SCIENCE

Scott Hall, Room 203
phone: (919) 515-2626
website: www.cals.ncsu.edu/poultry

S. L. Pardue, Head
B.W. Sheldon, Department Extension Leader
C. M. Williams, Undergraduate Coordinator
J.T. Brake, Director of Graduate Programs

William Neal Reynolds Professor: J.T. Brake; Alumni Distinguished Undergraduate Professor: S.L. Pardue, C.R. Parkhurst; Professors: K.E. Anderson, V.L. Christensen, W.J. Croom, Jr., F.W. Edens, P.R. Ferket, J.L. Grimes, W.M. Hagler, Jr., G.B. Havenstein, J.F. Ort, J.N. Petitte, B.W. Sheldon, J.C.H. Shih, T.D. Siopes, C.M. Williams, M.J. Wineland; Adjunct Professors: W.L. Bryden, M. Choct, P.A. Curtis, K.K. Krueger, T.F. Middleton, W.B. Roush, S.M. Shane, Z. Uni; Professors Emeriti: T.A. Carter, R.E. Cook, H.B. Craig, W.E. Donaldson, J.D. Garlich, E.W. Glazener, P.B. Hamilton, J.R. Harris, C.H. Hill, W.C. Mills; Associate Professors: D.K. Carver, P.E. Mozdziak; Assistant Professors: C.M. Ashwell, M.D. Koci, E.O. Oviedo-Rondon, C.R. Stark; Adjunct Assistant Professors: A. Gernat, J.V. Felts, C L. Heggen-Peay, R.O. Maguire, C.E. Whitfill, C.J. Williams; Associate Members of Faculty: S.M. Stringham (Entomology), D.P. Wages (College of Veterinary Medicine)

The Department of Poultry Science provides instruction in the principles of vertically integrated poultry production and in such related disciplines as nutrition, physiology, genetics, immunology, toxicology, biotechnology, and general poultry management. Through teaching, research, and extension, the department serves students, poultry producers, and allied industries. Poultry production has increased rapidly during the last two decades and ranks first in North Carolina as a source of agricultural income. North Carolina ranks third nationally in the production of poultry products. Growing demand for poultry products, our climate and economic conditions in the state provide a sound base for continued expansion.

Opportunities

The transition from small farm operations to large commercial poultry enterprises has created more specialized positions than there are available poultry graduates. Production-oriented positions and off-the-farm operations in areas such as processing and distribution offer new job opportunities. The allied industries— feed, equipment, financing, pharmaceutical and other supplies— need additional employees trained in Poultry Science. Graduates hold positions as managers and field representatives for business identified with or serving the poultry industry. Graduates are also employed in the communication and public relations sectors, as teachers, and extension and research specialists. Some graduates develop their own poultry businesses.

Curricula

Students desiring a Bachelor of Science degree with a major in Poultry Science may choose either the science or technology curriculum offered by the Department of Poultry Science. One may obtain a double major in other curricula through careful use of electives and/or summer school attendance. These students should consult the undergraduate advisers in the department(s) concerned. Currently, the pre-veterinary science student may obtain all requirements toward a Bachelor of Science degree in the science option. The science curriculum reflects a student's interest in the basic biological and physical sciences. These students are better prepared for advanced study in various disciplines such as genetics, nutrition, physiology, and pathology. Several pre-veterinary students are currently enrolled in this curriculum and are seeking a Bachelor of Science degree in Poultry Science. (See the Preprofessional Program in Veterinary Medicine).

The technology curriculum in Poultry Science is designed to prepare students for direct entry into the poultry industry upon graduation. It allows a greater selection of courses in business and economics; and offers a student both basic and applied knowledge in poultry production which can be utilized in a poultry operation upon graduation.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

Harrelson Hall, Room 161
phone: (919) 515-3180

E. L. Kick, Head
S. C. Lilley, Associate Head
D. A. Curran, Undergraduate Administrator
T.N. Greenstein, Director of Graduate Programs
S.C. Lilley, Department Extension Leader

Sociology Teaching, Research and Extension Faculty: Goodnight-Glaxo Wellcome Endowed Professor: C.R. Tittle; William Neal Reynolds Professor: R.C. Wimberley; Alumni Distinguished Graduate Professor: M.D. Schulman; Alumni Distinguished Professor: V.M. Aldige; Alumni Distinguished Undergraduate Professor: L.R. Della Fave; Professors: W.B. Clifford, T.J. Hoban, E.L. Kick,

J.C. Leiter, P.L. McCall, R.L. Moxley, E.M. Woodrum, M.A. Zahn; Associate Professors: M.P. Atkinson, R.F. Czaja, S.M. Decoster, R.L. Engen, T.N. Greenstein, S.C. Lilley, M.L. Schwalbe, W.R. Smith, M.E. Thomas, M.S. Thompson, R.J. Thomson, K.M. Troost; Assistant Professors: F. Chen, M. Crowley, S. McDonald; Professors Emeriti: E.M. Crawford, T.N. Hobgood, Jr., R.D. Mustian, L.B. Otto, M.M. Sawhney, M.E. Voland; Associate Professors Emeriti: R.C. Brisson, S.K. Garber, P.P. Thompson; Assistant Professors Emeritus: C.G. Dawson; Associate Member of the Faculty: J.R. Thigpen (Sea Grant); Adjunct Professor: A. Thompson (North Carolina A&T State University); Adjunct Associate Professor: C.R. Zimmer (University of North Carolina at Chapel Hill)
Anthropology Teaching and Research Faculty: Alumni Distinguished Undergraduate Professor: A.L. Schiller; Associate Professor: J.M. Wallace; Assistant Professors: D.T. Case, R.S. Ellovich, S.M. Fitzpatrick, J.K. Jacka, A.H. Ross; Associate Professors Emeriti: G.S. Nickerson, I. Rovner, M.L. Walek

The Department of Sociology and Anthropology offers introductory and advanced courses in sociology and anthropology covering the major subfields of the two disciplines. It also offers supervised fieldwork and practical experiences required for certain curricula in the department.

Aims of the departmental offerings are to provide majors with academic background and experience useful for many careers in government and industry or for pursuing advanced academic work (for a description of the graduate degrees offered by the department, see the Graduate Catalog) and to provide service courses to other students.

This department, jointly administered by the Colleges of Humanities and Social Sciences and Agriculture and Life Sciences, offers seven undergraduate curricula. The five curricula administered by the College of Humanities and Social Sciences are Bachelor of Arts in Sociology, Bachelor of Arts in Criminology, Bachelor of Arts in General Anthropology, Bachelor of Arts in Applied Anthropology, and Bachelor of Arts in Bioarchaeology.

Honors Program

In this program, outstanding majors pursue an individual program of study involving close working relations with departmental faculty. Twelve credit hours of honors courses will allow students to enhance their expertise in sociology and anthropology. Honors courses combine nine hours of credit in regular and independent study classes with a three-credit honors thesis done in consultation with a faculty honors adviser.

To be admitted, students must have earned 12 hours in their major and have a 3.25 overall GPA and a 3.25 in the major. To graduate with Sociology/Anthropology Honors, the student must have a 3.25 GPA overall and in the major. Successful completion of the program is noted on the student's transcript, diploma and at commencement.

Bachelor of Arts in Sociology

Sociology studies the behavior and interaction of people as they operate in society. The groups that people form such as families, peers, ethnic groups, and social classes are investigated. The following departmental requirements must be met by all students majoring in sociology: A minimum of 31 hours in the major field including SOC 202, SOC 300; theory, SOC 400 or 401; no more than three additional credit hours of 200-level sociology courses; and, at least 12 credit hours of 400-level or above sociology courses. Additional electives in sociology may be at the 300-level or above. ST 311 is also required.

Bachelor of Arts in Anthropology

The major introduces students to anthropology with basic and advanced offerings in the subdisciplines of the field. The comparative nature of anthropology is reflected by courses based in a variety of geographical areas. Theory and methods courses are required. An internship is required for the applied concentration.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Bachelor of Arts in Criminology

The Criminology degree seeks to develop a professional orientation that will be relevant both to occupational goals and participation as a citizen in community affairs. Courses provide a general background in the causes of crime and the agencies of criminal justice. More specific areas covered deal with deviance, juvenile delinquency, the court system, correctional facilities, and the like, including field placement in an agency of the criminal justice system.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Anthropology

A minor in Anthropology focuses on the comparative study of human beings, with emphasis on biology and behavior. A flexible selection of courses (15 credit hours) includes offerings from anthropological subdisciplines such as cultural anthropology, physical anthropology, archaeology, and linguistics.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Criminology

The criminology minor emphasizes criminological theory and research with substantive applications. The minor is grounded in sociological theory and methods and allows students flexibility in the choice of specialized criminological study such as juvenile delinquency, sociology of law, formal institutions of social control, community and crime, and data analysis in criminology, ideology and social justice.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Sociology

The minor emphasizes sociological theory and research with substantive applications. The minor builds on theory and methodology and allows students flexibility in the choice of sub-specialties such as stratification, race and ethnic relations, agriculture, development, work and organization, or the family.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

DEPARTMENT OF SOIL SCIENCE

Williams Hall, Room 2234
phone: (919) 515-2655
website: www.soil.ncsu.edu

M. G. Wagger, Department Head
D. L. Osmond, Department Extension Leader
H. J. Kleiss, Undergraduate Coordinator
T. J. Smyth, Director of Graduate Programs

Alumni Distinguished Graduate Professor: S.W. Buol; William Neal Reynolds Professors: S.W. Buol, J.W. Gilliam; Professors: A. Amoozegar, S.W. Broome, J. L. Havlin, D. L. Hesterberg, M.T. Hoover, G.D. Hoyt, D.W. Israel (USDA), H.J. Kleiss, D.L. Osmond, W.P. Robarge, T.J. Smyth, M.J. Vepraskas, M.G. Wagger; Adjunct Professors: P.G. Hunt, Professors Emeriti: D.K. Cassel, M.G. Cook, F.R. Cox, G. A. Cummings, C.B. Davey, W.A. Jackson, E.J. Kamprath, L.D. King, G.S. Miner, C.D. Raper, P.A. Sanchez, R.J. Volk, S. B. Weed, A.G. Wollum; Associate Professors: D.A. Crouse, C.R. Crozier, D.L. Lindbo, R.A. McLaughlin; Associate Professors Emeriti: J.P. Lilly, R.E. McCollum, G.C. Naderman, J.E. Shelton; Adjunct Associate Professor: R.C. Reich; Assistant Professors: A.K. Graves, R.O. Maguire, W. Shi, J.G. White; Adjunct Assistant Professors: C. Bogle, D. Hardy, B. Zanner; Associate Members of the Faculty: H.L. Allen (Forestry), R.W. Skaggs (Biological Agricultural Engineering)

The Department of Soil Science trains students in fundamentals of soils, develops an understanding and appreciation of soils as a resource, and presents principles of soil management and utilization for both farm and non-agricultural purposes. Soils constitute one of the largest capital investments in farming, and proper soil management is essential for efficient production. Future world food needs will require people conversant in soil resources and use of fertilizers. Soil properties are important considerations in urban-suburban planning and development. Also, knowledge of soil and its interaction with potential pollutants is essential in maintaining environmental quality. Therefore, the demand for people trained in soils by private consultants, agribusiness, research, service planning-development, education and conservation-related agencies should continue to be great.

Opportunity

Soil science graduates fill positions of leadership and service in land resource planning, environmental science, conservation, natural resource management and agriculture. Among these are opportunities as: farm operators and managers; county agricultural extension agents; employees of other public advisory agencies; and Natural Resources Conservation Service and other conservation-related agencies concerned with soil resources. Graduates also serve as technical representatives and salesmen in fertilizer companies and in other agribusiness activities. Many opportunities exist for privately consulting soil scientists who serve a variety of clientele needs. Environmental concerns usually require soil science expertise, especially in land-based waste management. Provisions are made for students wishing for more thorough training in biological sciences, chemistry, mathematics and physics leading to graduate study. (See the *Graduate Catalog* for a listing of graduate degrees). Students with an advanced degree have greater opportunities in teaching, research, service and extension with state, federal and private educational or research institutions and agencies.

Curricula

The Bachelor of Science degree may be obtained with a major in agronomy, natural resources or environmental sciences. The Agronomy Program is administered jointly with the Department of Crop Science. A soil science concentration is available in the Agronomy curriculum. Two soils concentrations are available in the Natural Resources curriculum, Soil Resources and Soil and Water Resource Systems. An Environmental Soil Science concentration is available in the Environmental Sciences curriculum. (The Agronomy, Natural Resources, and Environmental Sciences curricula are shown previously within the College of Agriculture and Life Sciences).

Minor in Soil Science

The minor in Soil Science is offered to students desiring a strong knowledge of the principles of Soil Science to complement their major. The program is intended to strengthen the understanding of basic physical and chemical soil properties that would be relevant to students interested in land management. These interests may include (but are not limited to) Forestry, Geology, Natural Resources, Environmental Sciences, Agronomy, Landscape Architecture, Horticulture, Biological and Agricultural Engineering, Agricultural Business Management, or Agricultural Education. Fourteen hours of required courses and three hours of electives are necessary to complete the minor.

DEPARTMENT OF ZOOLOGY

David Clark Labs, Room 127
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website: www.cals.ncsu.edu/zoology

D. Shea, Interim Head
J. F. Gilliam, Undergraduate Coordinator
T. L. Grove, Director of Graduate Programs
H. V. Daniels, Department Extension Leader

Professors: R.H. Anholt, B.L.Black, J.A. Collazo (USDI), J.F. Gilliam, W.C. Grant, R.M. Grossfeld, T.L. Grove, H.F. Heatwole, J.E. Hightower (USDI), C.F. Lytle, J.M. Miller, K.H. Pollock, R.A. Powell, J.A. Rice, T.R. Simons (USDI), C.V. Sullivan, H.A. Underwood; Adjunct Professors: F.A. Cross, L.B. Crowder, J.J. Govoni, D.E. Hoss, P.H. Kelley; Professors Emeriti: G.T. Barthalmus, P.T. Bromley, P.C. Bradbury, B.J. Copeland, W.W. Hassler, G.C. Miller, R.L. Noble, T.L. Quay, J.F. Roberts, D.E. Smith, J.G. Vandenbergh; Associate Professors: R.K. Borski, J.A. Buckel, H.V. Daniels, J.R. Godwin, N.M. Haddad, J.M. Hinshaw, T.J. Kwak (USDI), M. Niedzlek-Feaver; Adjunct Associate Professors: W.J. Fleming, R.M. Shelley, H.W. van de Veer; Assistant Professors: D.D. Aday, R.R. Dunn, B.J. Grubb, J.A. Lubischer, H.B. Patisaul; Assistant Teaching Professors: M.B. Hawkins; Adjunct Assistant Professors: E.M. Bennett, A.E. Bogan, D.T. Cobb, L.B. Daniel, J.A. Hare, R.W. Laney, M.S. Mitchell, K.L. Shertzer, W.C. Starnes; Instructors: L.D. Parks; Adjunct Instructors: A.L. Braswell, R.B. Hamilton; Associate Members of the Faculty: K. Gross (Statistics), E.J. Jones (Extension Forest Resources), S. Rebach (NC Sea Grant), T.G. Wolcott (Engineering and Marine, Earth, and Atmospheric Sciences)

The Department of Zoology provides undergraduate and graduate instruction in specialized biological sciences areas. Undergraduates study all levels of biological organization from the molecular to the community. Zoology majors are well prepared for graduate work in zoology and related fields of sciences. (See the *Graduate Catalog* for a listing of graduate degrees). Participation in supervised programs of research is strongly encouraged. A strong science background is provided for students planning to enter dentistry, medicine, optometry, veterinary medicine and allied health sciences, such as medical technology, physical therapy, and physician assistant. Ecology, including wildlife, fisheries, behavioral ecology and marine biology, is a strong area. Physiological biology, including reproductive endocrinology and neurobiology, is also emphasized.

Opportunities

Bachelor of Science graduates in zoology have many career options. Graduates are well prepared for employment in various government agencies or private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of biological sciences such as zoology, cell biology, wildlife and fisheries science, marine science and biomedical disciplines. Many also choose to seek degrees in medicine, dentistry, veterinary medicine and other health-related areas.

Curricula

The Bachelor of Science degree with a major in zoology is offered in the College of Agriculture and Life Sciences. Within this major a student may specialize to pursue individual interests. The zoology curriculum (SZO) prepares students for graduate school, medical, dental or optometry school (SZO/SDM), and for veterinary schools (SZO/SPV). Certain professional schools have specific requirements, which differ slightly from the zoology curriculum. Students should consult catalogs of specific professional schools to ensure completion of any special requirements. Other curricula offered by the Department of Zoology include the fisheries (SFF) and wildlife (SFW) sciences program and the environmental science program in ecology (ESC). Students are advised by faculty in their special areas of interest.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Zoology

A minor in zoology is available to all baccalaureate students at NC State University, except majors in other curricula within the Zoology Department (Biological Sciences, Fisheries, and Wildlife Science, and Environmental Science Ecology Concentration (ESC)). This minor may be useful to students applying to professional schools such as medicine, dentistry, veterinary medicine, and other health sciences. Basic knowledge in animal biology may be useful to students seeking careers in government, industry, or education. The minor consists of a minimum of 15-16 credit hours, including three core courses: ZO 150, ZO 250, and ZO 260 with a grade of "C-" or higher. The remaining courses must be selected from three- or four-credit zoology courses at the 300 level or higher.

NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE

Patterson Hall, Room 100
phone: (919) 515-2717
website: www.cals.ncsu.edu
e-mail: ag_research@ncsu.edu

J. C. Wynne, Dean, College of Agriculture and Life Sciences
S. Leath, Associate Dean and Director, NC Agricultural Research Service
R. Crickenberger, Associate Director, NC Agricultural Research Service
W. K. Collins, Coordinator, Tobacco Programs, NC Agricultural Research Service
W. Hagler, Assistant Director, Agricultural Sciences, NC Agricultural Research Service
G Gibson, Assistant Director, Life Sciences, NC Agricultural Research Service

The North Carolina Agricultural Research Service (NCARS) is the agricultural, life sciences, and home economics research agency of the State of North Carolina. Forestry research is a jointly conducted program between NCARS and the College of Natural Resources. NCARS is funded principally by appropriations from the North Carolina General Assembly, federal formula funds, grants and contracts.

The mission of NCARS is to develop the knowledge and technology needed to:

- Improve productivity, profitability and sustainability of industries in agriculture and the life sciences;
- Conserve and improve the state's natural resources and environment;
- Improve the health, well-being and quality of life of North Carolina's citizens;
- Provide the science base for research and extension programs.

Many research faculty in NCARS have joint appointments in teaching or extension. In classroom and informal teaching functions, our research scientists develop and teach quality science-based curricula in the fields of agriculture, biology, social sciences and the environment. Our faculty also contribute to the graduate training of students destined to become leaders, teachers, and scientists who will help sustain viable agriculture and life science industries.

Publications

NCARS publishes bulletins and scientific papers on research solutions to problems and opportunities that will benefit citizens, businesses and communities. Copies of technical bulletins may be obtained from the Department of Communication Services Customer Service at (919) 513-3045 and scientific papers from authors.

Services

The faculty of NCARS conducts research, which has a direct impact on the agriculture and life science industries in North Carolina. This research includes field and laboratory experimentation in the agricultural, biological, physical, social, and environmental sciences. Primary emphasis is given to the production, processing, distribution, and consumption of the many agricultural and forestry commodities and products produced throughout the State. Also, major attention is given to research programs focused on improving the quality of life of both rural and urban citizens.

NORTH CAROLINA COOPERATIVE EXTENSION SERVICE

Patterson Hall, Room 120
phone: (919) 515-2811
website: www.ces.ncsu.edu

J. C. Wynne, Dean, College of Agriculture and Life Sciences
J. F. Ort, Assistant Vice Chancellor, Associate Dean and Director North Carolina Cooperative Extension Service
J. P. Zublena, Associate Director, and Director of County Operations
E. J. Jones, Associate Director and State Program Leader, ANR/CRD
R.M. Stewart, Associate Director and Associate State Program Leader, 4-H Youth Development and Family and Consumer Sciences
T. A. Melton, Assistant Director and Associate State Program Leader, ANR/CRD
C. Dunn, Associate State Program Leader, Family and Consumer Sciences
T.T. McKinney, Associate State Program Leader, 4-H Youth Development

The North Carolina Cooperative Extension Service of North Carolina State University works in collaboration with the United States Department of Agriculture, the State of North Carolina, the 100 counties in the state and the Cherokee Indian Reservation. Its work is supported by federal funds made available under the Smith-Lever Act of 1914, as amended by state and county appropriations, by grants and contracts, and by foundations.

The federal and state appropriations are used to maintain an administrative and specialist staff and to pay a portion of the salary and the travel expenses of the county extension agents. Under this cooperative arrangement, the Cooperative Extension Service serves as the "educational arm" of the United States Department of Agriculture and as the "field faculty" of North Carolina State University in the areas of agriculture and natural resources, family living, 4-H youth, and community and rural development.

The primary purpose of the North Carolina Cooperative Extension Service is to provide the people of the state with research-based information emanating from NC State University and the Land Grant System, which is, related to:

- Strengthening the economy through profitable, sustainable and safe food, forest and green industry systems
- Protecting the environment and natural resources
- Empowering youth and families to lead healthier lives and become community leaders

This organization then helps citizen put this knowledge to work for economic prosperity, environmental stewardship and an improved quality of life. This program has sufficient flexibility to permit special attention, needs and interests of the people in each county. County Advisory Councils are utilized to determine and prioritize the county educational program content. Assistance is given to individuals, families, communities, agricultural and seafood processing and marketing firms, other businesses and certain organizations. This includes work with adults and youth in both the city and rural areas.

In carrying out this educational program, a variety of methods and techniques are employed: method and result demonstrations; meetings; visits to farms, homes and businesses; organized groups of men, women and youth; web-based information; tours; leaflets, pamphlets and other printed materials and mass media. The basic sources of information to be taught through this educational program are the findings and recommendations resulting from research conducted by the Agricultural Research Service in this and other states and by the United States Department of Agriculture.

AGRICULTURAL INSTITUTE

Patterson Hall, Room 107
phone: (919) 515-3248
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website: www.cals.ncsu.edu/agi

J. C. Wynne, Dean, College of Agriculture and Life Sciences
K. L. Esbenshade, Associate Dean, College of Agriculture and Life Sciences and Director, Academic Programs
B.M. Kirby, Associate Director of Academic Programs and Director, Agricultural Institute

The Agricultural Institute is a two-year academic program that awards the Associate of Applied Science Degree upon successful completion of at least one of nine curricula. The Agricultural Institute provides education and training in pest management, livestock management, agriculture, horticulture, turfgrass management and agribusiness. It is part of the academic programs in the College of Agriculture and Life Sciences at North Carolina State University. Provision for the Agricultural Institute was made by the 1959 North Carolina General Assembly and instruction began in the fall, 1960. The objective of the Agricultural Institute is to provide technical training for those desiring a comprehensive education in the agricultural sciences, agribusiness and related areas. The instructional programs of the Agricultural Institute are organized and conducted as part of the overall academic program in the College of Agriculture and Life Sciences. The Agricultural Institute is an addition to, and not a substitute for, the college's regular degree-granting program. The Agricultural Institute uses the same facilities (classrooms, laboratories, farms) as the four-year program. The facilities are used extensively for both teaching and observing the application of technology in agriculture and other closely related areas.

The faculty of the four-year program are responsible for organizing and teaching courses offered by the Agricultural Institute. Emphasis is placed on practical knowledge and training, with many courses requiring laboratories using hands-on experience. The Agricultural Institute offers majors in nine areas: Agribusiness Management; Agribusiness Management - Horticulture concentration; Field Crops Technology; General Agriculture; Livestock and Poultry Management; Ornamentals and Landscape Technology; Pest Management (Agricultural and Urban concentrations); and Turfgrass Management.

Opportunities

Rapid technical advancement has been important in changing agriculture from a small production industry to the nation's largest industry. Closely associated with production agriculture are those areas related to recreation and beautification such as turfgrass management, landscaping and ornamental plants.

Today's complex agriculture requires a large work force. This work force must have some technical training and be able to deal with a vast array of problems and opportunities. Graduates of the Agricultural Institute have the education and training that is in demand by the agricultural industries and that permits them to assume responsible positions in agriculture and allied fields. Some career examples include farm and herd managers, golf course superintendents, nursery managers, pest control specialists, sales and service of agricultural equipment and products, lawn care specialists and others. More job opportunities than graduates make salaries attractive and competitive. The College of Agriculture and Life Sciences maintains a Career Services Office to assist graduates in addressing resume construction, interviewing strategies, successful job search techniques, location of summer internships, and job market trends.

Entrance Requirements

Applicants must have graduated from an accredited high school with at least a 2.0 GPA (on a 4.0 system), or have successfully passed the General Education Development (GED) test before being admitted to the Agricultural Institute at NC State. An admission application, one letter of recommendation from someone other than a family member, a high school transcript and supporting documents must be submitted directly to the Admissions Office at NC State University. The regular college entrance exam (Scholastic Aptitude Test- SAT) is not required. The 2.00 minimum high school GPA is waived for transfer students and for

applicants 21 years or older at the time of enrollment in the Agricultural Institute. For additional information, write: Director, Agricultural Institute, Box 7642, 107 Patterson Hall, North Carolina State University, Raleigh, NC 27695-7642, phone: (919) 515-3428, website: www.cals.ncsu.edu/agi.

Programs of Study

Graduates of the Agricultural Institute are awarded the Associate of Applied Science degree. The nine programs of study are Agribusiness Management; Agribusiness Management - Horticulture Concentration; Pest Management and Technology (Agricultural and Urban concentrations); Field Crops Technology; Ornamentals and Landscape Technology; General Agriculture; Livestock and Poultry Management; and Turfgrass Management.

COLLEGE OF DESIGN

200 Brooks Hall
NCSU Box 7701
Raleigh, NC 27695-7701
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e-mail: design@ncsu.edu
website: www.design.ncsu.edu

College of Design

Now in its sixth decade, the College of Design at North Carolina State University has from the beginning prepared designers who, in the broadest sense, shape the world. Design education is more than an attempt to teach a set of technical skills. The environment—including the spaces in which people live and work, the products they consume, and the messages they receive— have a powerful impact on how humans function as a society. Good design, therefore, requires attention and sensitivity to social, economic, political, cultural, and behavioral issues. The aim of all design curricula in the College of Design is to develop the designer's perception, knowledge, skills, and problem-solving abilities.

The College of Design admits students through a selective process that ensures a highly motivated and heterogeneous design community. The entering student body consistently ranks at the top of academic achievement in the university and the college graduation rates are the highest in the institution. While providing undergraduate and graduate study in multiple disciplines and encouraging individual plans of study, the college functions as a unified, interactive education center, dedicated to preparing designers capable of shaping the environment to various scales, but always in response to society's needs.

Design Fundamentals - The First Year Experience

Students enter the College of Design into one of five departments. The first year experience centers on two six-credit hour studios that meet nine hours per week. The first semester studio, populated with a mix of students from the five disciplines, includes introductions to the design process, a design vocabulary, and fundamental principles of designing. Second Semester studios are content specific with students beginning to solve basic problems in their chosen discipline. Studio activities include hands-on work, discussions, demonstrations, critiques, and occasional field trips. Emphasis is on interaction, independence, self-discipline and self-motivation.

In both semesters, the fundamentals experience emphasizes learning to use the design process, establishing disciplined work habits, communicating about design using the design vocabulary learned in studio, and working in collaboration with others, thus forming the foundation for all subsequent design activity in the college and later in the professions.

Curricula and Degrees

The College of Design offers undergraduate instruction leading to the four-year Bachelor of Environmental Design in Architecture, Bachelor of Art and Design, Bachelor of Graphic Design, and Bachelor of Industrial Design, as well as a five-year degree program leading to the Bachelor of Landscape Architecture and a one-year postgraduate program leading to the Bachelor of Architecture Degree. The General Education component of each curriculum consists of courses in mathematical and natural sciences, physical education, science/technology/society, and communication and information technology. In addition to 6-credit design studios where students apply their expanding knowledge and skills to theoretical and practical design problems, majors in the College of Design take support courses dealing with design knowledge and skills, such as communication and presentation, human behavior, environment, history, philosophy, physical elements and systems, methods and management. The curriculum path has some flexibility, affording students the opportunity to concentrate in one area while making contact with the other design disciplines. In addition to their faculty mentors, students are exposed to a broad range of design professionals through guest lecturers, juries, projects, and workshops.

Graduate studies are designed for students who want to build on undergraduate education and professional experience, as well as for those who come from non-design backgrounds and want to pursue advanced design degrees. The college offers graduate study leading to the Master of Architecture, Master of Art and Design, Master of Graphic Design, Master of Industrial Design, Master of Landscape Architecture, and Ph.D. in Design. Please refer to the NC State University *Graduate Catalog* for specific curriculum information on master's and doctoral programs in the College of Design.

DaVinci Scholars Program

This joint program between the College of Design and the College of Humanities and Social Sciences allows students to earn two undergraduate degrees within five or six years - a bachelor's degree in one of the five undergraduate disciplines in the College of Design and a B.A. or B.S. degree in the College of Humanities and Social Sciences.

The primary purpose of the double degree is to provide students with a strong liberal education as a complement to their professional interests in design. For example, students majoring in Graphic Design, with a second degree that focuses on writing, may improve their opportunities for employment in communications. A student in Architecture with a second degree in history may improve opportunities for focused graduate study in architectural history, preservation, or urban planning. Study of a foreign language may improve students' opportunities for international design practice.

DaVinci Scholars earn their first degree in design with no adjustment in their design requirements. They elect a second major from any of those available in the College of Humanities and Social Sciences. Most students complete their second degree within one additional year of study or two summer sessions plus one additional semester. Students will be designated as DaVinci Scholars only during their first year of enrollment in the College of Design.

To qualify for the DaVinci Scholars Program students must:

- present a minimum GPA of 3.00 at the end of their first semester of study in the College of Design
- declare interest in the DaVinci Scholars Program in writing to the Associate Dean for Undergraduate Studies and Academic Support of the College of Design within their first year of study in the College of Design
- be selected by a review panel composed of faculty in the College of Design and faculty in the College of Humanities and Social Sciences and chaired by the Associate Dean for Undergraduate Studies and Academic Support of the College of Design.

For more information, please contact office of the Associate Dean for Undergraduate Studies and Academic Support, College of Design, 223 Brooks Hall, Box 7701, NCSU, Raleigh, NC 27695-7701; (919) 515-8310.

Minor in Design Studies (Non-Design Majors)

This minor's objectives are to provide a general orientation to the practice and theory of design for students whose primary study and employment will be in the other disciplines, to clarify the role design plays in society, and to create informed consumers who are able to make intelligent decisions about communication, products, and environments in work and in their personal lives. Any undergraduate student in the university who is not majoring in a design discipline would benefit from this program. Any student seeking this minor should contact the Associate Dean for Undergraduate Studies and Academic Support in the College of Design for an application and assignment of a minor adviser.

Anni Albers Scholars Program

The Anni Albers Scholars Program, a collaboration between the NC State University College of Design and the College of Textiles, provides students simultaneously with exemplary preparation in art and design and in textile technology. This rigorous program will greatly improve graduates' creative flexibility and employment opportunities by combining professional skills in design with high quality technological knowledge, making them innovative leaders in the field of textiles.

Students completing the Anni Albers Program will earn two undergraduate degrees; a Bachelor of Art and Design in the College of Design, and a Bachelor of Science in Textile Technology in the College of Textiles.

The program is named for a person who exemplifies the ideals and goals to which the program aspires; textile designer and artist Anni Albers. Anni Albers was educated in the Weaving Workshop at the Bauhaus and immigrated to the United States from World War II Germany. Albers, a noted textile designer, artist, and writer, brought her influential beliefs in the importance of textiles to Black Mountain School in North Carolina, and eventually to Yale University. Her work and writings have provided generations of American textile designers and fiber artists a philosophical framework and standard of excellence against which to measure progress and achievement in the medium.

Resources
The College of Design offers the Anni Alber Scholars a complete studio-based art and design education, beginning with a firm foundation in one of the country's best design fundamentals programs, followed by intensive upper level studios emphasizing design process and creative problem solving. Studio-based instruction in textiles is rooted in learning by making with the hands, thus all students make textiles on hand looms, and add color and pattern with hand screen printing and dyeing techniques. A basic knowledge of textile history underlies the entire curriculum. The Anni Albers Scholars take advantage of the Department of Art and Design's broad offerings in drawing, painting, sculpture, printmaking, color and light, illustration, animation and digital imaging. The college provides a hand weaving lab; a printing/dyeing lab; the Harrye B. Lyons Design Library; college and departmental computer labs; and materials labs (shop).

The College of Textiles will provide the Albers Scholars with instruction in textile technology, operations management, textile chemistry, and computer technology in textiles. The curriculum provides a fundamental understanding of textile technology in direct digital printing on fabric, computer aided design software for both knitted and woven fabrics and textile product development. CAD/CAM facilities and studio spaces are also available. The Model Manufacturing Facility in the college is 100,000 square feet of lab space with industrial scale textile equipment that provides complete manufacturing capability from bale-to-sale. The Burlington Textiles Library is also housed in the college.

Anni Albers Dual Degree Requirements
Applicants to the program must have completed successful admission to both the College of Design (including portfolio review) and the College of Textiles through the usual processes and meeting college deadlines. At the same time as applying to the colleges, or after arrival at NC State, students may apply to the Anni Albers Program. All applications are reviewed by faculty committees in each college. Students admitted to the program must maintain a minimum 2.8 GPA to remain in the program. The degree is 164 credit hours combining the essence of Art and Design and Textile Technology. General Education Requirements are arranged to meet the specified choices in both curricula. The degree requires five (5) school years. On-campus and off-campus transfer students must have a 3.0 University GPA to qualify for the program.

Advising
Albers Scholars will have academic advisers in both colleges. Individual interests, directions, needs and transfer credits may change the length of time required for completion of the program.

Advisers:
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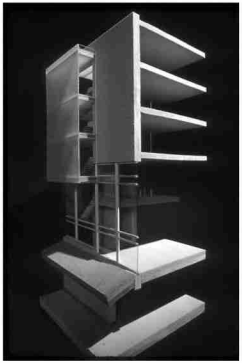

SCHOOL OF ARCHITECTURE

Brooks Hall
phone: (919) 515-8350

T. Barrie, Director
W. Redfield, Associate Director

Professors: T. Barrie, P. Batchelor, G. Bizios, R. Clark, M. Malecha, W. Place, J.P. Rand, F. Rifki, P. Tesar; Professor Emeritus: H. Sanoff; Associate Professors: F. Harmon, W. Redfield, K. Schaffer, J. Tector; Assistant Professors: J. Ficca; Associate Professor Emeritus: D. W. Barnes; Adjunct Professors: C. Bishir, D. Dixon, E. Harris, J. Mann, B. Shawcroft; Adjunct Associate Professors: S. Cannon, K. Hobgood, J. Lee, W.H. McKinnon, D. Stallings, E. Weinstein; Adjunct Assistant Professors: L. Cherry, K. Dautel, F. Gomes, T. Hicks, D. Hill, R. Lanou, T. Lineberry, T. Martin, T. McAuliffe, M. Robinson

In a world of changing conditions- social, cultural, economic and technological- the central task of the architect remains to give meaningful form to the physical environment. These rapid changes, however, force today's architects to not only concern themselves with traditional design issues like shelter, appropriateness, comfort, and beauty, but also to address emerging concerns like sustainability, environmental conservation, rapidly expanding cities, adaptive uses and preservation of older buildings, providing built environments in a global market, and new means of producing architecture. The aesthetic revolution of the past few decades has also freed architects from the rigidity of earlier theory allowing greater diversity and expressiveness in architectural design.

The School of Architecture has addressed the diversity of roles and responsibilities through its faculty and its curricula. Its distinguished faculty embraces a broad definition of the practice of architecture and is, therefore, free of a singular, dogmatic, or stylistic bias. This diversity is evident in their experience, area of interest, national origins, and educational backgrounds of the faculty. The architecture curriculum balances mathematics, English, natural sciences and humanities are integrated with architectural design studios and a rich selection of design support courses. The design studio- a working laboratory in which the student learns how to design buildings under the guidance of a professor- is central to the curriculum.

The undergraduate Bachelor of Environmental Design in Architecture is a preprofessional degree that stresses the education of the individual and serves as the foundation for advanced, professional study in the discipline. The first semester is spent on design fundamentals in studio common to all students in the College of Design. Following this introductory experience student receive a broad introduction to architectural design, theory, history, technology, and design processes while exploring educational opportunities within the university.

Following the preprofessional program students may continue their studies in either of two professional programs: the one-year, post-graduate Bachelor of Architecture or two-year Master of Architecture program (see the *Graduate Catalog* for information on the latter program). Entry into both of these programs is competitive. To be accepted students must demonstrate potential for professional accomplishment, capability in design, and satisfy a specific set of professionally-oriented undergraduate requirements. Many students spend one or more years gaining professional experience in architecture firms or related fields before pursuing the advanced degrees. Educational enrichment is an important characteristic of the architectural program. The College of Design regularly presents public lectures by leading professionals and exhibitions of design and artwork. Electives are available in related disciplines- painting, sculpture, photography, landscape architecture, industrial design, and graphic design. Also available are field trips to buildings in urban centers of architectural interest, urban design studios conducted at the College of Design's Downtown Design Studio, and a variety of foreign study programs including the College of Design's Prague Institute.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Accreditation

In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural 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 six-year, three-year, or two-year term of accreditation, depending on the extent of its 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, constitute an accredited professional education. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

Professional degree programs in the North Carolina State University School of Architecture (i.e. Master of Architecture and Bachelor of Architecture) are fully accredited by the NAAB. The Bachelor of Environmental Design in Architecture (BEDA) degree, being a preprofessional program, does not fall under NAAB accreditation jurisdiction although it serves as the foundation for the two accredited professional degrees.

The NAAB Conditions for Accreditation, including the required Student Performance Criteria, can be viewed on the NAAB website at www.naab.org.

DEPARTMENT OF ART AND DESIGN

Leazar Hall
phone: (919) 515-8315

C. Cox, Chair

Professors: S. Brandeis, C. Joyner, M. Pause; Professors Emeriti: C.M. McKinney, W. Taylor; Associate Professors: C. Cox, L.M. Diaz, P. Fitzgerald, D. Raymond, S. Toplikar; Assistant Professor: V. Plume; Adjunct Associate Professor: K. Rieder; Adjunct Assistant Professor: M. Cuales

The Department of Art and Design awards the Bachelor of Art and Design degree. The pedagogical core of the program aims to reinforce the foundation principles of design theory as applied to two-and three-dimensional design. Our curriculum addresses broad cultural, ecological, and societal considerations and promotes in our graduates the ability to meet the challenges of collaborative design. We emphasize the application of creative thinking and problem solving to design projects ranging from single to mass-produced artifacts. The areas of application span the range from traditional fine art to interactive media. Examples of current areas of study include computer imaging, animation, illustration, photography, sculpture, painting, drawing, fiber, exhibition design, and emerging areas in the media arts.

The Department of Art and Design firmly believes there is an essential need for students in the technically-based research university to engage in course work that fosters creative thinking. To meet this need, the department offers courses to non-majors as well as a minor in Art and Design, available to majors in any field in the university with consultation from a design adviser minors are guided through a selection of courses.

Opportunities

Career opportunities for graduates of the Department of Art and Design span the range from traditional fine art to new media systems. Graduates of this department are currently working in fields such as advertising, software design, multimedia, illustration, exhibition design, textile design, fashion design, art and design education, photography, filmmaking, special effects, set design, and in all areas of fine art.

Curricula and Degrees

The Department of Art and Design awards the Bachelor of Art and Design degree. The Bachelor of Art and Design degree is a broadly based, multidisciplinary undergraduate experience that fully utilizes a diverse faculty and bridges the fine arts and design. Through a well-planned sequence of increasingly complex and in-depth studios and close work with faculty, students are able to construct optimal learning paths that meet their individual needs. This degree program provides a sound, well-rounded visual arts education and focuses on providing students with skills that allow them to perform and succeed in a wide variety of art and design positions after graduation.

While the degree is not profession-specific, students selecting the Bachelor of Art and Design degree may wish to use it as a foundation for later graduate study in a specific art or design discipline. The goal of the Art and Design curriculum is to provide the structure for the creation of a new model of art and design professional. These individual's artistic and practical talents are developed as different expressions of one potentiality. We emphasize proficiency of skills in advanced visualization and interactive media in combination with a strong focus on traditional fine arts and design.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Art and Design (Non-Design Majors)

The Minor in Art and Design's objectives are to discover basic principles through hands-on activities, to apply design process and theory to solve problems creatively and efficiently, to increase awareness of one's self and environment, and to foster an appreciation and understanding of the disciplines of Art and Design. Any curious undergraduate student with an overall grade point average of 2.75 in the university who is not majoring in design and who seeks alternative methods of experiencing the environment in which we live will benefit from this minor.

The minor in Art and Design consists of 15 total credits hours of study, of which six (6) hours must be satisfied at the basic course level. The remaining 9 hours of courses may be selected from the course list in the information provided by the Art and Design adviser. A grade of "B" or better will be required for credit in all courses in the minor in Art and Design program. The course selection will be determined with guidance from the student's minor adviser and tailored to the needs, interests, and goals the of student. Interested students seeking this minor should contact Professor Charles Joyner.

Although, all efforts are made to accommodate minors, it is important for potential students to know and understand that access to Art and Design courses are based on a hierarchy where priority access goes to Art and/or Design majors.

DEPARTMENT OF GRAPHIC DESIGN

Brooks Hall
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Santiago Piedrafita, Chair
M. Davis, Director of Graduate Programs

Professors: M. Davis, M. Scotford; Professor Emeritus: A. Lowery; Associate Professors: K. Bailey, D. Gonzales Crisp, S. Townsend; Assistant Professors: P.A. Brock, W. Temple; Adjunct Assistant Professors: M. Dillon, K. Meaney

Graphic design is the process of bringing meaningful visual form to communication. Graphic designers translate communication goals through printed, environmental, and electronic presentations of information. Graphic designers use words and images to express messages that inform, persuade, and incite people to action. Graphic designers are active in all aspects of communication design. For example, they design books, magazines, newspapers, and CD-ROMS for the publishing industry. They also create printed materials such as logotypes, symbol, annual reports, newsletters, business forms, stationery systems, and other related literature for corporations, institutions, businesses, and governmental agencies. Graphic designers create multimedia presentations, websites, computer interfaces, and motion graphics such as film titling and typographic treatments for video, as well as on-air graphics for television. Graphic designers are employed in a variety of settings, including graphic design offices, advertising agencies, communication business, as well as corporations, institutions, or governmental agencies as part of internal communications departments.

The Bachelor of Graphic Design is a professional degree recognized by the American Institute of Graphic Arts (AIGA) and is accredited by the National Association of Schools of Art and Design (NASAD) The program includes the study of visual, theoretical, historical, and technical aspects of the discipline. The curriculum provides comprehensive experiences in the analysis of communication problems, the development of creative solutions to those problems, and the implementation and evaluation of those solutions. Required courses in typography explore the role of words and language in graphic communication, while courses in imaging provide students with experiences in a range of photographic, videographic, and computer media. Instruction in computer software programs is fully integrated in design courses, and is not taught as a separate activity. In their studios, graphic design majors prepare for careers in the field through the execution of demonstration projects of varying complexity and scale.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF INDUSTRIAL DESIGN

Brooks Hall
phone: (919) 515-8322

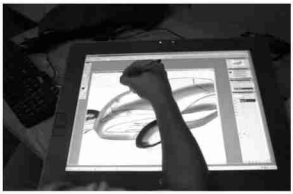
B. Laffitte, Chair
P. Hooper, Director of Graduate Programs

Professors: H. Khachatoorian, G. Lewis; Professor Emeritus: A. Cooke, V.M. Foote; Associate Professors: P. Hooper, B. Jin, B. Laffitte; Assistant Professors: T. Buie, S. Joines; Adjunct Assistant Professor: C. Jordan

The Department of Industrial Design awards a bachelor degree in Industrial Design. The pedagogical core of the department aims to reinforce the foundation principles of design theory as applied to traditional and advanced technologies, i.e. new media, materials, and production techniques. Our curriculum addresses broad cultural, technological, and societal considerations and promotes in our graduates the ability to meet the challenges of technological complexity through collaborative design. We emphasize the application of creative thinking and problem solving to design projects ranging from single to mass-produced artifacts. The areas of application span the range from industrial design to interactive multimedia.

Opportunities

Career opportunities for graduates of the Department of Industrial Design span the range from industrial design to new media systems. Graduates of this department are currently working in fields such as product development, furniture design, recreational product design, toy design, exhibition design, textile design, fashion design, photography, film making, special effects, set design, ergonomics and textile design.



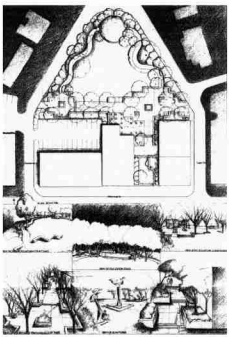
Curricula and Degrees

The Department of Industrial Design awards four-year bachelor degrees in Industrial Design. Industrial Design is concerned with all human aspects of machine-made products and their relationship to people. The industrial designer is responsible for product safety, aesthetics, maintenance, and cost. Industrial designers deal with consumer, and with industrial products. In order to achieve these ends, designers must be involved in four major design and research areas: human behavior, human-machine relationships, the environment, and the product itself.

Areas of study in the Bachelor of Industrial Design include furniture, textiles, house wares, appliances, transportation, tools, farm equipment, medical instruments, electronics, human-computer interfaces, and recreational support equipment. The goal of the Industrial Design curriculum is to teach the design and development of products or systems and their relationship to human beings and the environment.

Graduates of the Bachelor of Industrial Design program have career opportunities in three general types of practice: corporate design offices in manufacturing companies, independent consulting offices, and governmental agencies.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula



DEPARTMENT OF LANDSCAPE ARCHITECTURE

Brooks Hall
phone: (919) 515-8340

Gene Bressler, Chair

Professors: R. Moore, A.R. Rice; Professors Emeriti: A.R. Abbate, R. Stipe, R.R. Wilkinson; Associate Professors: F. Magallanes; Associate Members of the Faculty: H. Devine (Parks Recreation and Tourism Management), P. Lindsey (Horticulture Department), T. Shear (Forestry Department); Research Associate Professor: J. Tomlinson; Adjunct Associate Professors: C. Burger, S. Hatchell, M. Hough, M. Jennings, D. Swanson, R. Swink; Teaching Assistant Professors: K. Boone, L. Milburn; Adjunct Assistant Professors: R. Craig, C. Delcambre, J. Massey Lelekacs, J. Sherk, C. Van Der Wiele

The educational mission of the Department of Landscape Architecture is to nurture ecologically responsible professionals to serve communities by investigating, understanding, creating and celebrating landscapes, through interdisciplinary practice, to sustain the cultures and resources of planet Earth.

Landscape architecture is a multi-faceted profession dedicated to the welfare of the physical environment and the living communities of the earth. It is a diverse and growing design profession that combines art, science, engineering, and technology. Landscape Architecture at the College of Design is especially concerned with the stewardship, restoration, and regeneration of the natural and cultural environments in urban, rural, and wilderness settings. The five-year Bachelor of Landscape Architecture degree program provides an educational experience that develops in students the skills necessary to deal creatively and responsibly with the human and natural forces that inevitably shape the land.

The Bachelor of Landscape Architecture program stresses the development of the student's intellectual capacity through comprehensive design education. The program offers an integrated, broad-based approach to the discipline of Landscape Architecture, emphasizing interdisciplinary course work, national and international experience, and ecologically sound community-based design and planning. Students develop the ability to think, visualize, analyze, and synthesize ideas using information and skills from diverse fields of study.

College of Design

This professional degree program fosters the development of an individual's sense of responsibility to society as a steward of cultural and natural environments. Graduates of the Bachelor of Landscape Architecture program have an understanding of the profession, its role in society, and their own potential role. Graduates offer employers and clients strong intellectual problem solving abilities and the professional skills necessary to evaluate, develop, and communicate solutions to a variety of design and planning problems including, but not limited to, the design of parks, trail systems, recreational environments, resorts, urban plazas, communities, and conservation plans.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

The Department of Landscape Architecture currently enjoys full accreditation from the Landscape Architecture Accreditation Board (LAAB).

COLLEGE OF EDUCATION

208 Poe Hall
NCSU Box 7801
Raleigh, NC 27695-7801
phone: (919) 515-2231
fax: (919) 515-5901
ced.ncsu.edu

College of Education

Mission: The College of Education is a voice of innovation for learning across the life span. We prepare professionals who educate and lead. Our inquiry and practice reflect integrity, a commitment to social justice, and the value of diversity in a global community.

Vision: To be a nationally ranked, research-intensive, professional College of Education with distinction for working, teaching and learning in technology enhanced environments.

Undergraduate degree programs are offered in business and marketing education, education general studies, elementary education, mathematics education, middle grades education, science education, and technology education. In addition to being admitted to a curriculum, all teacher education candidates must meet program requirements for admission to candidacy in teacher education (including a 2.5 or higher overall grade point average after the sophomore year) and for admission to student teaching (including a 2.5 or higher GPA overall in one's teaching field, and in professional studies.)

Degree programs lead to a license to teach in technology education or business and marketing education (grades 9-12); and mathematics education and science education (grades 9-12). The college offers undergraduate degree programs in elementary education and middle grades teaching with dual concentrations either in language arts/social studies or mathematics/science (grades 6-9); students may pursue a single concentration in middle grades mathematics or science.

A program of professional preparation is provided for those students enrolled in the College of Humanities and Social Sciences who wish to become teachers of secondary English or social studies (grades 9-12) and teachers of French and Spanish (grades K-12). The College of Agriculture and Life Sciences and the College of Education jointly provide a program to prepare students to become agriculture teachers (grades 9-12).

Students enrolled in a natural sciences or a mathematical sciences curriculum may double major in the Department of Mathematics, Science, and Technology Education and earn a license to teach (6-9 or 9-12).

Most of the education programs listed in the following pages also offer graduate-level degree programs. In addition, the College of Education has graduate programs in:

Adult and Higher Education
Counselor Education
Curriculum and Instruction
Educational Administration
Educational Leadership and Policy Studies
Elementary Education
Higher Education
Middle Grades Education
Reading Education
Special Education
Training and Development

See the *Graduate Catalog* or contact faculty members for information on graduate programs. Public schools post-master's licensure programs are available in some curricular areas.

All of the bachelor's level and graduate level licensure programs are approved by the North Carolina State Board of Education. The college is accredited by the Council for the Accreditation of Counseling and Related Programs (CACREP) and the National Council for the Accreditation of Teacher Education (NCATE).

The College of Education is located in Poe Hall. It includes a Learning Resources Library and Instructional Computing Labs. The building houses laboratories for technology education, reading, science, counseling and testing activities.

Scholarships and Awards

The College of Education has a scholarship program distinct from the campus Merits and Awards Program. Over 20 scholarships are awarded to undergraduates each year. Several scholarships are available to encourage students from under-represented populations to enroll in the college.

North Carolina State University is one of 18 institutions participating in the N.C. Teaching Fellows Program and has over 160 Teaching Fellows enrolled. Each Fellow receives $6,500 per year for four years in exchange for a commitment to teach for four years in-state.

Many students receive awards through the North Carolina State Board of Education's Scholarship Loan Fund for Prospective Teachers and through other sources. High school counselors receive information about, and applications for, all of these scholarships and awards.

The Speece Scholarship is awarded to as many as three outstanding juniors or seniors either in mathematics education or science education. The department sponsors two undergraduate organizations: the Mathematics and Science Education Club and the Technology Education Collegiate Association. Annual awards are given to the outstanding seniors in Mathematics Education (9-12), Science Education (9-12), Technology Education (7-12), and Middle Grades Education (6-9) in mathematics and in science. Technology education students are eligible for the Epsilon Pi Tau Leadership Award.

For more information on Scholarships and Awards visit ced.ncsu.edu/deans/student_services/scholarship.html.

Honors Society

The College of Education maintains the Omicron Rho chapter of Kappa Delta Pi, an international honor society in education. It elects those to membership who achieve high academic and exhibit the ideals of scholarship, high personal standards, and promise in teaching and allied professions.

SAY Village

The college and University Housing have partnered to provide a living and learning residential experience called Students Advocating for Youth (SAY Village). Housed in Syme Hall, this experience targets students interested in working with youth. No matter what the major or aspirations for the future, advocating for youth spans many fields of study. For more information, visit www.ncsu.edu/housing/communities/say. Additionally, sophomore students who return to SAY Village and live in Syme Hall comprise what is known as the "DAY" portion of the program - "Determined Area Youth." The DAY component enables those students returning to SAY to teach self-advocacy skills to area youth.

International Activities

Faculty members have been involved in overseas projects in China, Ghana, Japan, New Zealand, Peru, Puerto Rico, Russia, and South Africa. Some of the foreign language teacher education students spend a year in France or Spain in an exchange program. International students in several of the education programs and elsewhere at NC State participate in on-campus, multi-cultural opportunities.

Accreditation

Teacher Education programs at NC State University are accredited by the North Carolina State Board of Education and the National Council for Accreditation of Teacher Education. For information regarding Title II Survey Data, please visit: ced.ncsu.edu/teachered/title2.html.

DEPARTMENT OF ADULT AND HIGHER EDUCATION

(See *Graduate Catalog*)

DEPARTMENT OF EDUCATIONAL RESEARCH LEADERSHIP AND POLICY STUDIES

(See *Graduate Catalog*)

DEPARTMENT OF CURRICULUM AND INSTRUCTION

Poe Hall, Room 602
phone: (919) 515-3221
ced.ncsu.edu/ci

E. S. Vasu, Department Head
S. R. Ting, Assistant Department Head
E. R. Gerler, Director of Graduate Programs in Counselor Education
R. J. Pritchard, Director of Graduate Programs in Curriculum and Instruction

Alumni Distinguished Undergraduate Professors: C.M. Beal, C.A. Pope; Alumni Distinguished Professors of Extension and Engagement: R.J. Pritchard, A.J. Reiman, H.A. Spires; Professors: S.B. Baker, C.L. Crossland, D.A. Cullinan, B.J. Fox, E.R. Gerler, Jr., P.L. Marshall, T.P. O'Brien, J.A. Picart, G. Ponder, C.A. Pope, R.J. Pritchard, E.J. Sabornie, H.A. Spires, E.S. Vasu; Professors Emeriti: L.K. Jones, D.C. Locke, B.M. Parramore, B.R. Poulton, N.A. Sprinthall; Associate Professors: C.M. Beal, J. Lee, S. Nassar-McMillan, J.W. Osborne, S.S. Osborne, A.J. Reiman, S.S. Snyder. S.R. Ting; Visiting Associate Professors: T.H. Stafford, Jr.; Adjunct Associate Professors: B.M. Gorham, R.D. Safrit; Associate Professors Emeriti: J.F. Arnold, B.C. Talley, L. Thies-Sprinthall; Assistant Professors: J.T. DeCuir-Gunby, M.A. Grimmett, L. Holcomb, J.L. Nietfield, K. Oliver, C. Young; Research Assistant Professors: A. Overbay; Teaching Assistant Professors: D.B. Cherukuri, H. Lupton-Smith, J.R. Smith; Visiting Assistant Professors: R. Honeycutt; Adjunct Assistant Professors: R.E. Callanan, T.E.H. Conway, D. Crissman,L. Grable, L. Huffman, S.T. Johnson, M.K. Monaco, J. Rakes, M. Stumpf-Downing; Adjunct Lecturers: K.L. Hill, D.K. Wagner; Lecturers: C.P. Caddell.

The Department of Curriculum and Instruction prepares undergraduate students to become teachers of language arts and social studies in middle grades (6-9), or teachers of business or marketing courses in middle and secondary schools. The Department currently includes a diversity of highly qualified students. All programs emphasize scholarship and individually designed study, and include cross-disciplinary work, field-based experiences and allow for semester abroad options.

CURRICULUM IN BUSINESS AND MARKETING EDUCATION

Poe Hall, Room 402 T. O'Brien, Coordinator
phone: (919) 515-1743

The Business and Marketing Education curriculum is specifically designed to prepare professional teachers to teach business or marketing courses in the middle and secondary schools. All graduates are qualified to be licensed by the State of North Carolina as

either business or marketing education teachers (grades 7-12). In addition, it provides the necessary pedagogical and technical preparation needed by business and marketing instructors in community and technical colleges, as well as preparing students for selected training and development roles in business and industry. The combination of a broad general and professional education, business and marketing courses, and supervised work experience in marketing occupations provides a unique preparation for educators in a rapidly expanding professional field.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

CURRICULA IN MIDDLE GRADES EDUCATION

Middle Grades Education, Language Arts and Social Studies Concentration

Poe Hall, Room 402 C. Pope, Coordinator
phone: (919) 515-1776

The Middle Grades Language Arts and Social Studies (MSL) undergraduate program in the Department of Curriculum and Instruction seeks to prepare teachers who can effectively educate young adolescents, while being responsive to their unique needs, interests, and abilities. Graduates earn licensure for teaching in grades 6-9 in two subject disciplines: language arts and social studies. Even though the Undergraduate Catalog states, "All undergraduate students will be required to have at least a 2.0 GPA in order to graduate," the Department of Curriculum and Instruction requires its students to maintain a 2.5 GPA throughout the program. A 2.5 GPA is a statewide requirement to student teach. Therefore, it is likely that all MSL majors will graduate with a higher GPA than required by the university. Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

For Middle Grades Education, Mathematics/Science Concentration, see the Department of Mathematics, Science, and Technology Education.

ENGLISH TEACHER EDUCATION

Tompkins Hall, Room 268 Barbara Bennett, Coordinator of Advising
phone: (919) 515-4167

Students desiring to become secondary English teachers in grades 9-12 will be enrolled in the College of Humanities and Social Sciences. In that college's section of this catalog, curriculum requirements for the teacher education option can be found under the Department of English. Students desiring to become language arts teachers in grades 6-9 will be enrolled in the College of Education.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

FRENCH TEACHER EDUCATION

Withers Hall, Room 207 Diane Fagin Adler, Program Coordinator, French Teacher Education
phone: (919) 515-9293

Students desiring to become teachers of French will be enrolled in the College of Humanities and Social Sciences. In that college's section of this catalog, curriculum requirements for the teacher education option in French can be found under Foreign Languages and Literatures. See the following website for more information: sasw.chass.ncsu.edu/fl.

SOCIAL STUDIES TEACHER EDUCATION

Poe Hall, Room 402
phone: (919) 515-9655

K. M. Troost, Coordinator of Advising, Sociology (LTS)
K. Vickery, Coordinator of Advising, History (LTH)
S. Carey, Coordinator of Advising, Political Science (LTP)

Students desiring to become secondary social studies teachers in grades 9-12 will be enrolled in the College of Humanities and Social Sciences. Curriculum requirements for the teacher education options can be found under history, political science and public administration, and sociology and anthropology in that college's section. Students desiring to become social studies teachers in grades 6-9 will be enrolled in the College of Education. For details on the latter, consult the Middle Grades Education description.

SPANISH TEACHER EDUCATION

Withers Hall, Room 321 Susan Navey-Davis, Coordinator of Advising
phone: (919) 515-9288

Students who wish to become licensed to teach Spanish K-12 by the State of North Carolina will be enrolled in the College of Humanities and Social Sciences. The curriculum requirements for the teacher education option in Spanish (LTA curricula) can be found under information for the Department of Foreign Languages and Literatures in the College of Humanities and Social Sciences.

DEPARTMENT OF ELEMENTARY EDUCATION AND TEACHING

402D Poe Hall
phone: (919) 513-4631

Ellen McIntyre, Department Head
Jennifer Mangrum, Assistant Department Chair

The Department of Elementary Education and Teaching offers a four-year Bachelor of Science degree to a cohort of students in Elementary Education and Teaching consisting of three components: 1) general studies required by the university, 2) interdisciplinary subject-matter emphases that build on disciplines of the general studies component (mathematics, statistics, and logic; science, and 3) professional studies that include pedagogical courses and field experiences. Integral to the professional studies component are themes of diversity and technology. Satisfactory completion of the 123-124 credit-hour degree would result in the awarding of the Bachelor of Science degree in Elementary Education and Teaching and a recommendation for the North Carolina "A" level K-6 teacher's license.

The elementary education curriculum will provide NC State University future teachers with more study in the disciplines of mathematics and the sciences than is customary in elementary teacher preparation programs. As a means of directly addressing the competencies required by The NC Department of Public Instruction and to be at the leading edge of the professional field, the NC State program will include more specialized methods courses as well as supervised field experiences in mathematics, science, and technology than typical elementary education teacher preparation programs.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

Poe Hall, Room 326
phone: (919) 515-2238

J. E. Penick, Head
A. Y. Scales, Assistant Head
S. B. Berenson, Director of Graduate Programs for Mathematics Education
J. H. Wheatley, Director of Graduate Programs for Science Education
V. W. Deluca, Director of Graduate Programs for Technology Education

Alumni Distinguished Undergraduate Professors: W.J. Haynie, J.R. Kolb, Professor Emeritus, J.C. Park, L.V. Stiff, L.W. Watson, Professors: S.B. Berenson, J.E. Penick, G. Jones, L.V. Stiff; Professors Emeriti: D.A. Adams, N.D. Anderson, L.M. Clark, H.E. Speece; Associate Professors: T.J. Branoff, G.S. Carter, A. Clark, V.W. DeLuca, W.J. Haynie III, K.S. Norwood, J.C. Park, J.H. Wheatley, E.N. Wiebe; Associate Professor Emeriti: R.E. Peterson, W.M. Walters, Jr., R.E. Wenig; Research Associate Professor: H.S. Stubbs; Assistant Professors: L.A. Annetta, M.R. Blanchard, H.S. Lee, K. Hollebrands, T.E. Varnado; Teaching Assistant Professors: J.R. Busby, B. Matthews, A.Y. Scales; Assistant Professor Emeritus: J.L. Crow, W.J. Vanderwall; Visiting Associate Professor: T. Oppewal; Visiting Assistant Professor: J.V. Ernst; Clinical Instructor: S.U. Patton, E. Williams, Lecturer: B.P. Broadwell, W. Kelly, J.F. Freeman; Lecturers Emeriti: G.K. Hillard, B.D. Webb

The Department of Mathematics, Science and Technology Education prepares undergraduate students to become teachers of mathematics, science and technology. The department traditionally prepares competent professionals who have strong subject matter backgrounds and pedagogical skills. Departmental majors may seek licensure for teaching high school grades 9-12 or middle grades 6-9. Students in the high school curriculum in mathematics or science education take approximately 45 percent of their program in science and mathematics and may complete a double major, receiving a second degree in mathematics or one of the sciences. Students in Technology Education may be licensed as teachers of technology programs in middle grades and high schools, 7-12. All pre-service teaching programs provide a broad background; an in-depth study in mathematics, technology or an area of science; and the development of professional competencies. In addition, the technology education curriculum provides a non-teaching and graphic communications option with a general background for a variety of employment opportunities in business and industry. A minor in Technology Education is available.

The department also offers a minor in Graphic Communications in which the student develops proficiency in applying graphic techniques in both career and leisure activities.

CURRICULA IN EDUCATION, GENERAL STUDIES

Poe Hall, Room 502L
phone: (919) 515-1749

J. R. Kolb, Coordinator of Advising

The General Studies Education program has two areas of emphasis. Emphasis A serves those students who are interested in those fields of education that do not require formal licensure, such as juvenile group homes, day care centers, and other public and private agencies. Emphasis B serves those students previously enrolled in teacher education programs at North Carolina State University, but whose career goals have changed.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

CURRICULA IN MIDDLE GRADES EDUCATION (GRADES 6-9 LICENSURE)

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Middle Grades Education, Mathematics Concentration

Poe Hall, Room 510E
phone: (919) 515-6907

K. S. Norwood, Coordinator of Advising

Middle Grades Education, Mathematics/Science Concentration

Poe Hall, Room 315B
phone: (919) 515-6920

G. S. Carter, Coordinator of Advising

CURRICULA IN MATHEMATICS EDUCATION, SECONDARY

Poe Hall, Room 326
phone: (919) 515-1061

E. Williams, Coordinator of Advising

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

CURRICULA IN SCIENCE EDUCATION, SECONDARY

Poe Hall, Room 315B
phone: (919) 515-6920

G. S. Carter, Coordinator of Advising

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

CURRICULA IN TECHNOLOGY EDUCATION

Poe Hall, Room 502
phone: (919) 515-1748

W. J. Haynie III, Coordinator of Advising TED and TEN Programs
A. Y. Scales, Coordinator of Advising TGC Program

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Graphic Communications

Poe Hall, Room 510
phone: (919) 515-1754

T. J. Branoff, Coordinator of Advising

This is a 15 hour minor develops competencies in selecting and applying graphic techniques in both career and leisure activities, provides in-depth manual and computer skills, and enriches visual perception and critical though in graphic areas. Minor programs are individually designed to meet the needs of the student and to fit with the student's major, such as engineering or technology education.

AGRICULTURAL TEACHER EDUCATION

218 Ricks Hall, Box 7607
phone: (919) 515-1758

J.L. Flowers, Coordinator of Advising

Students desiring to become teachers of agriculture will be enrolled in the College of Agriculture and Life Sciences. The curriculum requirements for the teacher education program can be found under the Department of Agricultural and Extension Education. For more information, please see the following website: www.cals.ncsu.edu/agexed.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

COLLEGE OF ENGINEERING

118 & 120 Page Hall
NCSU Box 7904
Raleigh, NC 27695-7904
phone: (919) 515-2315
fax: (919) 515-8702
e-mail: engineering@ncsu.edu
website: www.engr.ncsu.edu

College of Engineering

Men and women who seek a challenging technical career in research and development, design, construction, production, maintenance, technical sales, management, teaching, or other careers requiring a methodical, creative solution of problems, should consider an engineering or computer science education. At NC State, the College of Engineering has a distinguished and internationally recognized faculty, and the College of Engineering offers an opportunity for ambitious men and women to become the leaders and prime movers of our increasingly technological world. Because of the great influence of science and technology on our everyday lives, today's engineers and computer scientists must be acutely aware of, and responsible for, the effects their creations may have on society. In addition to safety, aesthetics, economics, and energy, today's technologists must consider environmental, sociological, and other "human concern" costs.

The college's graduates work in diverse careers around the world. Most are practicing engineers, but because their education has equipped them well to address problems in a wide variety of fields, many College of Engineering graduates have become corporate presidents, lawyers, medical doctors, and leaders in government. The College of Engineering is organized into twelve departments: Biological and Agricultural Engineering; Biomedical Engineering; Chemical and Biomolecular Engineering; Civil, Construction, and Environmental Engineering; Computer Science; Electrical and Computer Engineering; Industrial and Systems Engineering; Materials Science and Engineering; Mechanical and Aerospace Engineering; Nuclear Engineering; Paper Science and Engineering; and Textile Engineering. Eighteen undergraduate degree programs are offered in these twelve departments. In addition, a degree program in Engineering is offered by special arrangement to the very few students who can clearly demonstrate the need for an individualized program of study. All departments also offer advanced studies leading to master's degrees and the Doctor of Philosophy degree. Consult the *Graduate Catalog* for graduate degrees.

The College of Engineering requests and receives accreditation from the Engineering Accreditation Commission of the Accrediting Board for Engineering and Technology (ABET) for sixteen of its undergraduate engineering degree programs. These are aerospace engineering, biological engineering, biomedical engineering, chemical engineering, civil engineering, computer engineering, construction engineering and management, electrical engineering, engineering-mechatronics, environmental engineering, industrial engineering, materials science and engineering, mechanical engineering, nuclear engineering, paper science and engineering, and textile engineering. The Bachelor of Science in Computer Science program is accredited by CAC/ABET (the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.). Accreditation ensures that these programs satisfy requirements for acceptance by these nationally recognized agencies. All curricula and programs are designed to maintain the college's national and international reputation while meeting the needs of the people and industries of the state and region through effective instruction, competent research, and the development of new and meaningful contributions to scientific knowledge.

The Career Planning and Placement Center is maintained by the university to assist continuing students and graduating students in achieving their career goals.

Degrees

Entering students receive assistance in planning an appropriate program of study and have available continued guidance from academic advisers throughout their academic careers. Beginning freshmen enroll in the First Year Engineering Program for one to two years. After successfully completing matriculation requirements, students may be admitted to a departmental Degree Program. In order to be eligible to apply for admission into a degree program, unmatriculated students must successfully complete the following courses: MA 141 and MA 241; PY 205; ENG 101; CH 101, 102(lab); E 101 and a satisfactory grade in E 115. In addition, students must have achieved a total GPA of 2.9 within the first 60 hours of enrollment at NC State.

Bachelor of Science: The baccalaureate program provides preparation for entry into industry, government, business or private practice as well as graduate school. Graduates with a B.S. degree in engineering or computer science may be engaged in design development, production, construction, sales, maintenance, or the planning, operation or management of industrial units.

The undergraduate curricula offer programs of study leading to bachelor's degrees in aerospace engineering, biological engineering, biomedical engineering, chemical and biomolecular engineering, civil engineering, construction engineering and management, computer engineering, computer science, electrical engineering, environmental engineering, industrial engineering, industrial engineering-furniture manufacturing option, materials science and engineering, mechanical engineering, nuclear engineering, paper science and engineering, and textile engineering. Graduation requirements include completion of one of the seventeen curricula with an overall grade point average of 2.0 and a grade point average of 2.0 in the major courses. The total number of required credits ranges from 120 to 128 semester hours.

Double Degree Programs

NC State students may wish to earn Bachelor of Science degrees in two fields from the College of Engineering. When the two courses of study are planned early and carefully, a number of courses can simultaneously satisfy requirements in both degrees. Humanities, social science, physics, mathematics, chemistry, English, and physical education sequences are common to most curricula. Students interested in such a program should consult the Office of Academic Affairs (118 Page Hall).

Other students may wish to combine a Bachelor of Science from the College of Engineering with a Bachelor of Science or Bachelor of Arts degree in another college at NC State University. A number of courses required for one degree may also satisfy requirements for a second degree. When the two courses of study are planned early and carefully, a double-degree program can be completed in as few as five years. Students interested in such a program should contact the Office of Academic Affairs (118 Page Hall).

Student Activities

Each department in the College of Engineering has technical societies open to every student enrolled in the respective degree(s). In most cases, these are student chapters of national professional organizations. Each curriculum also has one or more honor societies to give recognition to students who have earned superior academic records. In addition, there are college-wide honor, professional, and service societies that offer personally and educationally rewarding opportunities for students. Such societies include, for example the Engineers' Council, Society of Women Engineers (SWE), and National Society of Black Engineers (NSBE). For more information about student organizations, visit students.engr.ncsu.edu.

Humanities and Social Sciences

Each student in the College of Engineering is required to take a minimum of 21 credit hours of humanities and social science courses. At least one course used to fulfill the requirements must be selected from the list of courses which focuses on a non-English speaking culture. All of the courses used to satisfy the humanities and social science requirement must be taken from the College of Engineering list of approved courses and all must be completed with regular grading. For a list of approved courses, visit www.engr.ncsu.edu/students/documents/HSS046.pdf.

International Opportunities

The college is actively working to provide its students with opportunities for overseas study experience. In addition to the Study Abroad Program, which is available to all students at NC State, College of Engineering students can participate in an exchange program with: Segovia, Spain; Czech Republic; Zhejiang, China; Rio de Janeiro, Brazil; INNOVATE Technology & Leadership Conference in Asia; and others. Students that choose to study abroad may earn an International Certificate from the College of Engineering. Students interested in these opportunities should contact the Office of Academic Affairs (118 Page Hall).

Cooperative Education Program

This optional program is structured so that the student will alternate semesters of study with semesters of practical work as sophomores and juniors. The freshman and senior years are spent on campus, while sophomore and junior academic work is spread over a three-year period to permit alternating academic semesters with work-experience semesters. Students earn a salary while they are in industry, and they may earn a sufficient income to finance much of their college education. The co-op plan can be completed in five years, during which time the student receives 12 to 18 months of industrial experience.

Students in all curricula in the College of Engineering may apply for the co-op program if they have a grade point average of 2.5 or better. Application for admission into the co-op program should be made early in the spring semester of the freshman year. However, later applications resulting in fewer work semesters prior to graduation will be considered during the sophomore year or the first semester of the junior year. Students must be admitted into an engineering degree program prior to beginning the first co-op assignment. Further information may be obtained from the Office of Cooperative Education, 300 Clark Hall or online at www.ncsu.edu/co-op_ed.

Benjamin Franklin Scholars Program

A limited number of freshmen in the College of Engineering are selected to participate in the Benjamin Franklin Scholars Program. Students completing the program receive a Bachelor of Science in an engineering discipline or in computer science and a bachelor's degree in humanities or social sciences.

This double-degree program, a joint undertaking of the College of Engineering and the College of Humanities and Social Sciences, provides a unique opportunity to integrate a solid base of knowledge in technology or science with a broad humanistic and social perspective. The curriculum for the double-degree program has four main components: (1) a strong general education, (2) specially designed interdisciplinary courses, (3) all technical course requirements associated with the engineering or computer science degree, and (4) and a second major in the humanities and social sciences chosen from among the traditional majors or an interdisciplinary major. Students who have matriculated in the College of Engineering and declared a major in the College of Humanities and Social Sciences and have at least a 3.0 GPA are generally eligible for scholarships from the program. With careful planning, the program can be completed in five years. For more information, contact the Program Director, Dr. Joseph Herkert, joe_herkert@ncsu.edu, or the Office of Academic Affairs (118 Page Hall).

Computers

The College of Engineering provides its students with a large number of workstation labs for the purpose of running high-end engineering applications. In addition, freshmen are expected to own a laptop computer to use in classroom, lab, and mobile settings. The first-year lab course, E115, Introduction to Computing Environments, instructs students in the use of their own computers to interface effectively with the vast resources of the college computing environment, named "Eos." The course emphasizes the student's responsibility for her or his own computer, including security and hands-on maintenance. Computers, both lab-based and student-owned, are central to engineering education in the college.

Transfer Program

Students with non-engineering degrees or one or more years of academic work completed at other institutions may apply for transfer admission to the College of Engineering through the University Admissions Office. Students are admitted from four-year institutions as well as from junior and community colleges. Students currently attending or anticipating attendance at other institutions are advised to contact the Office of Academic Affairs for information on transfer course credit and admission to NC State.

DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING

David S. Weaver Laboratories, Room 100
phone: (919) 515-2694
website: www.bae.ncsu.edu

R.O. Evans, Head
T.M. Losordo, Jr., Department Extension Leader
S. A. Hale, Undergraduate Coordinator

Distinguished University Professor and William Neal Reynolds Professor: R.W. Skaggs; Professors: D.B. Beasley, C.J. Bowers, Jr., M.D. Boyette, R.O. Evans, Jr., S.A. Hale, G.D. Jennings, T.M. Losordo, J. Spooner (Extension), L.F. Stikeleathers, P.W. Westerman, T.B. Whitaker (USDA), D.H. Willits; Adjunct Professors: L.M. Safley, Jr., S.S. Schiffman, L.F. Sykes; Professors Emeriti: C.F. Abrams, Jr., J.C. Barker, G.B. Blum, Jr., J.W. Dickens, L.B. Driggers, J.M. Fore, E.G. Humphries, W.H. Johnson, G.J. Kriz, W.F. McClure, F.M. Richardson, R.P. Rohrbach, A.R. Rubin, R.E. Sneed, R.S. Sowell, C.W. Suggs, R.W. Watkins, E.H. Wiser, J.H. Young; Associate Professors: G.R. Baughman, J.J. Classen, R.L. Huffman, G.T. Roberson; Assistant Professors: M. Chinn, J. Cheng, G.L. Grabow, W.F. Hunt, III, S. Shah, R. Sharma, L. Wang, M.W. Veal; Extension Assistant Professor: M.R Burchell; Adjunct Assistant Professors: D.M. Amatya, S.K. Seymour; Extension Specialists: D.E. Line, J.M. Rice, R.L. Sherman; Associate Members of the Faculty: C.R. Daubert (Food Science), B.E. Farkas (Food Science), S.C. Roe (Companion Animal & Special Species Medicine), K.P. Sandeep (Food Science), K.R. Swartzel (Food Science)

The Department of Biological and Agricultural Engineering offers a four-year undergraduate program in Biological Engineering (BE). The BE curriculum includes concentrations in agricultural engineering, bioprocess engineering, and environmental engineering. All concentrations emphasize basic science and engineering courses that provide a sound background for application of engineering principles to biological and agricultural problems.

Opportunities

Students learn to solve a wide variety of engineering problems and will have opportunities for specialization. Scientific and engineering principles are applied: to analyze, understand and utilize mechanical properties of biological materials; to the conservation and management of soil and water resources; to the design of sensor-based instrumentation and control systems for biological and agricultural applications; to the design and development of machinery systems for all phases of agricultural and food production; to the design of structures and environmental control systems for housing animals, plant growth, and biological product storage; to the design and evaluation of ergonomic devices for human and animal applications; and to the development of improved systems for processing and marketing food and agricultural products.

Graduates of the BE curriculum receive a B.S. in Biological Engineering, qualifying them for positions in design, development, and research in both industry and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Some positions filled by recent BE graduates include: product design; development and testing; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

Curricula

The BE curriculum is jointly administered by the College of Engineering and the College of Agriculture and Life Sciences and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, phone: (410) 347-7700. Graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements.

The educational objectives of the Biological Engineering (BE) Bachelor of Science (B.S.) degree are to produce graduates who within the first few years following graduation, will be:

- Prepared to establish successful careers in engineering, as related to one of the specialized program focus areas: Agricultural, Bioprocessing and Environmental.
- Able to grasp and apply engineering principles, procedures, and time management skills needed to solve complex, real-world problems especially as related to the fields of man-machine systems, greenhouse and animal structures, agricultural water and waste management, and unit operations in food and biological systems.
- Professionally responsible in their work ethic while performing engineering tasks at a high level of expertise and willing to accept the ethical responsibility for the social and environmental impacts of engineering practices.
- Able to communicate effectively with diverse audiences and able to work effectively in today's integrated team environments.
- Broadly educated engineers and life-long learners, with a solid background in the biological sciences, engineering sciences and mathematics with an understanding and appreciation for the arts, humanities, and social sciences, and with a desire to seek out further educational opportunities.
- Knowledgeable of current advances in engineering practice and research; prepared for opportunities in graduate engineering education and prepared to progress towards registration as a professional engineer.
- Capable of contributing to the future economic and social well-being of citizens of North Carolina, the nation, and the world.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

JOINT DEPARTMENT OF BIOMEDICAL ENGINEERING

2147 Burlington Laboratories
phone: (919) 515-5252
website: www.bme.ncsu.edu

H. T. Nagle, Founding Head/Chair
L. A. Cartee, Undergraduate Coordinator

Professors: A.J. Banes, E. Grant, H. Hsaio, S.B. Knisley, W. Lin, C.N. Lucas, T.R. Magnuson, H.T. Nagle, E. Pisano, J.M. Ramsey, L.M. Reid, L. Weili, B. Whitsel; Associate Professors: L.A. Cartee, R.G. Dennis, O.V. Favorov, C.C. Finley, M.G. McCord, R. Naranyan, H.O. Ozturk, H. Pillsbury, S.R. Quint, M.A. Tommerdahl, P.S. Weinhold; Assistant Professors: C.M. Gallippi, M. Giddings, R.L. Goldberg, S. Gomez, D.S. Lalush, E.G. Loboa, J.M. Macdonald, G. McCarty, P.L. Mente, B.N. Steele, G.M. Walker; Associate Faculty: J.P. O'Donnell, W.E. Snyder.

Biomedical engineering is a profession that develops and applies engineering knowledge and experience to solve problems in biology and medicine and to enhance health care. Biomedical engineers are professionally trained to combine the rigors of medical and biological studies with the power of engineering analysis and design. People become biomedical engineers to be of service to others, to enjoy the excitement of understanding living systems, and to use state-of-the-art science and technology to solve the complex problems of medical care. The emphasis in biomedical engineering is on finding solutions by researching, testing, and applying medical, biological, chemical, electrical, and materials information. Biomedical engineers are unique individuals who make contributions to health care that are both satisfying to themselves and beneficial to others.

Opportunities

Biomedical engineers are employed by hospitals, pharmaceutical companies, medical device and testing companies, government agencies, universities, and medical schools. With so many areas of specialization within the field, graduates are encouraged to further their education by attending graduate or professional school after graduation from NC State. Graduates from this program have attended graduate programs in biomedical engineering, physical therapy, mechanical engineering, industrial engineering, microbiology, virology, public health, and sports physiology at many different institutions. Graduates who have taken additional courses to satisfy entrance requirements have also been accepted by medical, dental and pharmacy schools.

Curriculum

The department offers the Bachelor of Science in Biomedical Engineering. The objectives of the curriculum are the following:

- Define and solve problems in basic medical sciences and human health by integrating engineering and biology using engineering analysis, experimentation, mathematical, and scientific principles.
- Design biomedical systems, components, and processes by applying the scholarly and practical skills of engineering and life sciences using methods of modern engineering design and manufacturing, teamwork, and communication skills.
- Use technical and hands-on knowledge in engineering practice, research, and management while exercising ethical and professional responsibility in the public, private, and academic sectors.
- Become leaders and mentors that consistently enhance their information literacy by participating in activities that introduce them to advances in biomedical engineering practice and research.

Novel aspects of the undergraduate program include capstone engineering design projects that combine real world engineering design and community outreach, opportunities to apply for industrial internships after completing junior-level engineering courses, continuous and caring faculty advising, student involvement in program evaluation and improvements, and engineering specialization in one of three areas: Biomechanics, Biomaterials and Tissue Engineering, or Biomedical Instrumentation. Computers are used throughout the program. Graduates will be prepared for professional employment in research, design, development, and sales in government or industry, and for graduate and professional education in engineering and the life sciences. The program is jointly administered by the College of Engineering and the College of Agriculture and Life Sciences. First year students interested in this curriculum should enroll in the College of Engineering undesignated program and indicate BME as their curriculum choice. The biomedical engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012; phone: (410) 341-7700.

The current specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Scholarships

Students in this degree program are eligible for scholarships from the College of Engineering.

Facilities

Teaching facilities are located in the David S. Weaver Laboratories on the central campus. These facilities include state-of-the-art classroom and laboratory facilities, study space, and convenient access to computing resources. Faculty offices are located in Burlington Laboratories, Weaver Laboratories, the College of Textiles, and various other academic areas on campus. Contact offices for advising are maintained in Burlington Laboratories and in Weaver Laboratories. Extensive Internet and video-conferencing capabilities are deployed to facilitate convenient faculty-student contact.

Research facilities are located in Weaver Laboratories, Burlington Laboratories, and the College of Textiles as well as in the laboratories of many other faculty from throughout the university who do research in biomedical engineering areas. Facilities include access to advanced materials testing instrumentation, imaging resources, rapid prototyping facilities, biomedical instrumentation, and clinical resources.

DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

Engineering Building 1, Room 2001
phone: (919) 515-2324

P. K. Kilpatrick, Head
P. S. Fedkiw, Associate Head
S. A. Khan, Director of Graduate Programs
L. G. Bullard, Director of Undergraduate Studies

Frank Hawkins Kenan Distinguished Professor: R.G. Carbonell; H. Worley Clark Distinguished University Professor: K.E. Gubbins; Distinguished University Professor: D.F. Ollis; Camille Dreyfus Distinguished Professor: C.K. Hall; Alcoa Professor: R.M. Kelly; Camille Dreyfus Professor Emeritus: H.B. Hopfenberg; Hoechst-Celanese Professor Emeritus: R.M. Felder; Professors: R.G. Carbonell, J.M. DeSimone, P.S. Fedkiw, C.G. Grant, J. Genzer, K.E. Gubbins, C.K. Hall, R.M. Kelly, S.A. Kahn, P.K. Kilpatrick, P.K. Lim, D.F. Ollis, M.R. Overcash, G.N. Parsons, G.W. Roberts, R.J. Spontak; Adjunct Professors: D.J. Hammond, G. Findenegg, D.J. Kiserow, J.B. McClain, C. Quah, K.L. Roberts, M. Sliwinskia-Bartowiak, J.J. Spivey, S. White, P. Vlcek; Professors Emeriti: K.J. Bachman, K.O. Beatty, R.M. Felder, H.B. Hopfenberg, C.J. Setzer, H. Winston; Associate Professors: C.R. Daubert, J.M. Haugh, H.H. Lamb, S.W. Peretti, O. Velev; Assistant Professors: B.M. Rao.

The sound management of material, environmental, and energy resources, taking into account natural economic constraints, guides the performance of chemical and biomolecular engineering practice. Chemical and biomolecular engineering education integrates design and analysis, science and technology, with communication skills developed through exposure to the humanities and the social and economic sciences. Chemical engineering organizes these diverse skills into a coherent discipline uniquely suited to the needs of the chemical, biochemical, environmental, petroleum, plastics, textile, and pulp and paper industries.

Facilities

Departmental teaching and research activities are based on the first two floors comprising the east wing of Engineering Building 1, which opened in January 2005. Equipment for studying the principles of fluid flow, heat transfer, distillation, absorption, and drying is maintained in several laboratories. Chemical reaction kinetics, including heterogeneous catalysis and polymerization, are studied on specially designed equipment. Extensive apparatus is available for characterizing the relationships between molecular structure and bulk properties of polymers. A 20,000 square foot biotechnology laboratory has been equipped to include a pilot plant for synthesizing genetically engineered proteins in cell culture bioreactors. Specialized digital computational equipment complements campus-wide university computer resources. The department makes constant use of the College of Engineering Eos computer system that is accessible for use 24 hours a day by students and faculty.

Opportunities

Graduates find employment at attractive salaries in diverse subdisciplines including research and development, production, management and administration; process control, technical service, and sales; estimation and specification writing; consulting and teaching. Students desiring careers in teaching, research, or consulting are advised to consider graduate training (consult the *Graduate Catalog*). Chemical and biomolecular engineering graduates often pursue careers in law or the medical sciences since the broadly structured undergraduate curriculum provides strong preparation for graduate study in a wide range of professional specialties.

Minor in Chemical and Biomolecular Engineering

In addition to B.S. graduates of the chemical and biomolecular engineering program at NC State, there is a pool of students in other disciplines whose professional work assignments may require a knowledge of chemical engineering nomenclatures, technologies, and methods. The minor in chemical engineering is intended to allow such students to develop an understanding of the fundamental concepts and practice of chemical engineering. This minor should be most attractive to undergraduate students in environmental engineering, pulp and paper technology, and chemistry, and it will allow non-chemical engineering majors to prepare themselves for graduate study in chemical engineering with a minimum amount of prerequisite work following their acceptance into the graduate program.

Students enrolled in the minor in chemical engineering must complete CHE 205, CHE 225, CHE 311, CHE 315, CHE 316, and CHE 446. All the courses must be completed with a grade of "C-" or higher. An application for the minor must be submitted to the Director of Undergraduate Studies in the Department of Chemical and Biomolecular Engineering. Admission to the minor will require a minimum 2.5 over-all grade point average at NC State and a grade of "B-" or higher on the first enrollment in CHE 205.

Curricula

The successful practice of chemical engineering requires a broad, diversified preparation. The spirit of research and experimental inquiry is vital; students, therefore, require sound scientific backgrounds essential to original and disciplined thought, enthusiastic inquiry and, ultimately, original and constructive accomplishment. The undergraduate curriculum emphasizes the scientific, engineering, and economic principles involved in the design and operation of chemical processes.

Design methodologies are practiced in all core chemical and biomolecular engineering courses. This integrated design experience culminates with the senior design sequence, CHE 450 and CHE 451. The background in organic, physical, and inorganic chemistry is comparable to the training offered to chemistry majors. Mathematics, physical sciences, and distributed humanities courses are also required. The chemical engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012; phone: (410) 341-7700.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Program Educational Objectives

Our department's mission is to excel in teaching and research within the discipline of chemical and biomolecular engineering. To accomplish this, we are committed to the following educational objectives:

- To educate students to apply a strong core of knowledge and practice that represents chemical engineering, engineering science, and analytical problem solving.
- To encourage our students to enhance their educational experience by offering in a series of advanced chemical engineering topics including honors programs, CHE options, and classes.
- To prepare students with professional skills to convert knowledge into the implementation of ideas, often leading to success in new ventures.
- To commit faculty time and resources to providing our students with a comprehensive, quality education

Biomolecular Concentration in Chemical Engineering

By enhanced exposure to the biological sciences, the biomolecular concentration enables the student to develop insight into biological systems and processes.

Nanoscience Concentration in Chemical Engineering

The nanoscience concentration allows the student to develop an understanding of the scientific and technological principles associated with the design and manufacture of patterns and devices with features and advanced functionality on the nanometer scale.

Green Chemistry & Engineering Concentration in Chemical Engineering

The green chemistry and engineering concentration introduces students to the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.

Honors Program in Chemical Engineering

The honors program allows talented students to gain a deeper understanding of chemical engineering principles than would be acquired by completing the standard CHE curriculum Admission to the program requires students to have earned a minimum overall GPA of 3.5 and a minimum GPA of 3.5 in CHE 205 and CHE 225. An honors thesis is required for completion of the honors program.

DEPARTMENT OF CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING

Mann Hall, Room 208
phone: (919) 515-2331
website: www.ce.ncsu.edu

G. F. List, Head
D. W. Johnston, Associate Head for Graduate Programs
J.M. Nau, Associate Head for Undergraduate Programs
D. W. Parish, Coordinator of Advising

Distinguished Professor of Civil Engineering and Construction: S. Rizkalla; Professor: M.A. Barlaz, J.W. Baugh, Jr., R.C. Borden, R.H. Borden, E.D. Brill, Jr., H.C. Frey, M.A. Gabr, J.E. Hummer, D.W. Johnston, N.P. Khosla, Y.R. Kim, G.F. List, V.C. Matzen (Alumni Distinguished Undergraduate Professor), J.M. Nau (Alumni Distinguished Undergraduate Professor), M.F. Overton, M.S. Rahman, W.J. Rasdorf, N.M. Rouphail; Distinguished University Professor Emeritus: J.M. Hanson, P.Z. Zia; Professors Emeriti: M. Amein, P.D. Cribbins, R.A. Douglas, J.F. Ely, J.S. Fisher, A.K. Gupta, K.S. Havner, C.L. Heimbach, Y. Horie, H.R. Malcom, S.W. Nunnally, C.C. Tung, H.E. Wahls; Associate Professor: J.J. Ducoste, F.L. de los Reyes, M.N. Guddati, A. Gupta, T. Hassan, D.R.U. Knappe, M.J. Kowalsky, M.L. Leming, G. Mahinthakumar, S.R. Ranjithan, R. Seracino, J.R. Stone, A.A. Tayebali; Adjunct Associate Professor: L.R. Goode, D.R. van der Vaart; Associate Professor Emeriti: W.L. Bingham, A.C. Chao, E.D. Gurley, J.C Smith; Assistant Professor: S. Arumugam, T.M. Evans, E.A. Sumner, B.M. Williams, J. Yu; Lecturer:

R.A. Nunez, D.W. Parish, E.C. Weaver; Adjunct Assistant Professor: J.C. Brantley, D.H. Loughlin; Interinstitutional Adjunct Faculty: J.D. Bowen, R.A. Luettich, D.H. Moreau, H.D. Robertson, S.M. Rogers, Jr., J.S. Wu

The Department of Civil, Construction, and Environmental Engineering offers several degree programs concerned with the improvement and care of both public and private infrastructure and natural environments. The degree programs address the planning, design, construction, operation, and maintenance of buildings, dams, bridges, harbors, power facilities, pollution control facilities, and water supply and transportation systems. The curricula provide academic preparation for students considering careers in civil, construction, or environmental engineering.

The department offers undergraduate degree programs leading to the Bachelor of Science in Civil Engineering, the Bachelor of Science in Construction Engineering and Management, and the Bachelor of Science in Environmental Engineering. All three programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012; phone: (410) 347-7700. Graduation from an ABET accredited engineering degree is the first step toward licensure as a Professional Engineer. All three programs also prepare students for graduate education.

Opportunities

People will always need constructed facilities to live, work, and sustain their lives and environment, and civil, construction, and environmental engineers will always be needed to plan, design, and construct these facilities. Civil, construction, and environmental engineering comprises such a diversified field that graduates have a wide choice in locations and type of employment. Jobs range from federal, state, or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a big city, an industrial center, or even in a foreign country. Careers in either professional practice or teaching and research are common for many graduates who complete advanced degrees.

Facilities

The Department of Civil, Construction, and Environmental Engineering has well-equipped laboratories, including a computer laboratory. The College of Engineering at NC State maintains a state-of-the-art computing environment known as Project Eos, a large-scale distributed system that consists of approximately 665 workstations in 23 labs. Over 80 of these machines are housed by the Department of Civil, Construction, and Environmental Engineering in Mann Hall. A comprehensive suite of engineering applications is delivered to three platforms: Sun Solaris, Microsoft Windows, and Red Hat Linux. Project Eos is operated by a professional support group that provides consultation and basic system and software services.

The department's other laboratories contain a variety of special equipment for instruction and research in structures, mechanics, soils, construction materials, construction engineering, hydraulics and environmental engineering.

The Constructed Facilities Laboratory (CFL) on Centennial Campus features unique facilities devoted to all aspects of constructed infrastructure research and assessment. Facilities include: specially designed reaction floors and walls for testing large-scale structural systems to failure, such as full scale bridge girders up to 100 feet long and beam-column systems subject to earthquake loading; and large pits up to 20 feet deep for testing granular and compacted soils for foundation strength. State-of-the-art facilities like these heighten students' learning experiences by exposing them to the forefront of technological advances.

Curricula

The Department of Civil, Construction, and Environmental Engineering at NC State is home to the educational programs in Civil Engineering, Construction Engineering and Management, and Environmental Engineering. A single department head and management structure direct the educational missions of these three related fields. Each curriculum is designed to prepare the graduate for a career in the respective field and for lifelong learning through graduate education, continuing education and/or self-study.

Civil Engineering Degree

The Civil Engineering curriculum provides academic discipline in mathematics, the physical sciences, the humanities and social sciences, and the technical aspects of civil engineering. After introductory exposure to several of the professional areas such as environmental and water resources, geotechnical, structures, and transportation engineering, the student builds additional depth in one of these specialties.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Educational Objectives in Civil Engineering
The educational objectives of the Bachelor of Science degree program in Civil Engineering are as follows:

- To prepare students for entry into successful careers in Civil Engineering, emphasizing the mastery of engineering fundamentals, the ability to solve engineering problems, the importance of engineering judgment and engineering experimentation, and the process of engineering design.
- To instill in students the sense of pride and confidence that comes from applying their knowledge of engineering principles and procedures to the economic and social benefit of society.

- To encourage in students an understanding of the professional and ethical obligations of the engineer, to conduct themselves as professionals, recognizing their responsibility to protect the health and welfare of the public, and to be accountable for the social and environmental impact of their engineering practice.
- To establish an educational environment in which students participate in multi-disciplinary, team oriented, open-ended activities that prepare them to work in integrated engineering teams.
- To offer a curriculum that encourages students to become broadly educated engineers and life-long learners, with a solid background in the basic sciences and mathematics, an understanding and appreciation of the arts, humanities, and social sciences, an ability to communicate effectively for various audiences and purposes, and a desire to seek out further educational opportunities.
- To expose students to advances in engineering practice and research as preparation for opportunities in professional practice and graduate education.
- To acquire, maintain, and operate facilities and laboratory equipment appropriate to the civil engineering program, and to incorporate traditional and state-of-the-art technology and methods.
- To recruit, develop, and retain faculty who are committed to the educational mission of the civil engineering program, to ensure that these educational objectives are met.

Construction Engineering and Management Degree

The Construction Engineering and Management curriculum is designed for the student interested in the planning, design, direction, and management of construction projects. It includes the core course requirements in mathematics, the physical sciences, and the humanities and social sciences. After exposure to engineering fundamentals and engineering design of facilities, the curriculum provides a series of specialty courses in construction engineering related to the analysis, design, and management of the construction building, residential, highway, and heavy construction industry. The Mechanical Construction Concentration is designed for students pursuing a mechanical construction career, emphasizing systems for buildings, residences, and industrial facilities.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Educational Objectives in Construction Engineering and Management

- To prepare students for entry into successful careers in Construction Engineering and Management, emphasizing a fundamental understanding of construction engineering and management principles, the ability to solve a broad set of engineering problems in construction, the importance of engineering judgment and the creative process of engineering design.
- To introduce students to the practice of construction engineering, the design of the construction process, and the management of construction projects to achieve safety, quality, durability, and economic objectives.
- To enable an understanding of the societal and economic impacts of construction engineering practice and the professional and ethical responsibilities of the construction engineer.
- To provide learning opportunities which prepare the construction engineering and management graduate to function in team-oriented, multidisciplinary, open-ended engineering activities.
- To provide a curriculum which broadly educates students with: a solid background in the basic sciences and mathematics; an ability to communicate effectively; an understanding and appreciation for the humanities, social sciences, and management services; and an ability to engage in life-long learning through graduate study, mentoring, self study, or continuing education.
- To establish and maintain the institutional support and financial resources to recruit, develop, and retain faculty who are committed to the program objectives and the university missions, and to acquire, maintain, and operate adequate facilities to meet program objectives and promote learning.

Environmental Engineering Degree

The Environmental Engineering curriculum is designed for students interested in environmental protection. The curriculum provides students with basic knowledge of the chemical, biological and physical processes that govern the transport and fate of pollutants in the environment as well as the design of engineered treatment systems. Upon graduation, students are prepared to work in the areas of water and wastewater treatment, air pollution control, solid waste management, and hydrology and water resources. The curriculum emphasizes the interdisciplinary nature of environmental engineering with courses in both engineering and life sciences, including specialized courses on pollution control and waste management.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Educational Objectives in Environmental Engineering

- To prepare students for entry into successful careers in Environmental Engineering, emphasizing the mastery of environmental science and engineering fundamentals, the ability to solve engineering problems, the importance of engineering judgment and the creative process of engineering design.
- To introduce students to engineering practices for the management of air, water, and terrestrial environments and the protection of human health, and to encourage students to develop an understanding of the overall significance environmental issues.
- To provide students with an understanding of the professional and ethical obligations of the engineer, to encourage them to conduct themselves as professionals in recognition of their responsibility to protect the health and welfare of the public, to explain to students their accountability for the social, economic, and environmental impacts of their engineering practices.
- To provide students with an understanding of the role of the environmental engineer in engineering projects and to establish an educational environment in which students are prepared to function in cross-disciplinary, team-oriented, open-ended activities.
- To encourage students to become broadly educated as engineers and life-long learners, with: a solid background in the basic sciences and mathematics; an ability to communicate effectively; an understanding and an appreciation for the arts, humanities, and social sciences; and a desire to seek out further educational opportunities.

- To expose students to advances in environmental engineering and research as preparation for opportunities in graduate education.

Post-Baccalaureate Study

If a student is interested in more intense specialization in one particular area, advanced level training is available leading to the Master of Civil Engineering, the Master of Science or the Doctor of Philosophy. Specialization areas include coastal engineering, computer-aided engineering, construction engineering and management, construction materials, environmental and water resources engineering, geotechnical engineering, mechanics and structural engineering and transportation engineering. With judicious choices of electives during the B.S. program, a student may also prepare for additional studies in law, business administration, business management and city and regional planning.

Student Activities and Scholarships

Student chapters of the American Society of Civil Engineers, American Concrete Institute, Associated General Contractors, National Association of Home Builders, Institute of Transportation Engineers, and Air and Waste Management Association undertake projects to further student exposure to the profession. Guest speakers representing various aspects of engineering practice speak at weekly lunch meetings. Students who accumulate outstanding academic records may be considered for membership in the Chi Epsilon Honorary Society. Through the generosity of industry and program alumni, many scholarships are available on a competitive basis to students in addition to university, college, and need-based financial aid.

DEPARTMENT OF COMPUTER SCIENCE

EBII, Rooms 3320 & 1204
phone: (919) 515-2858
website: www.csc.ncsu.edu

M. A. Vouk, Head
D. J. Thuente, Director of Graduate Programs
D. R. Bahler, Director of Undergraduate Programs
B. J. Adams, Director of Advising

Distinguished University Research Professor: D.L. Bitzer; Alumni Distinguished Graduate Professor: H. Perros; Alumni Distinguished Undergraduate Professor: A.L. Tharp; SAS Institute Chair Professor: J. Doyle; Emeritus Professors: W. Chou, R.E. Funderlic, W.E. Robbins; Professors: D.L. Bitzer, E.W. Davis, Jr., J. Doyle, R.J. Fornaro, S.P. Iyer, D.F. McAllister, H.G. Perros, D.S. Reeves, R.D. Rodman, G.N. Rouskas, C.D. Savage, M.P. Singh, W.J. Stewart, A.L. Tharp, D.J. Thuente, M.A. Vouk; Associate Professors: A.I. Anton, D.R. Bahler, E.F. Gehringer, C.G. Healey, T.L. Honeycutt, J.C. Lester, F. Mueller, P. Ning, I. Rhee, R.A. St. Amant, M.F. Stallmann, B. Watson, L.A. Williams, P.R. Wurman, R.M. Young; Assistant Professors: R.Y. Chirkova, R. Dutta, V. Freeh, K. Harfoush, S. Herber, X. Ma, R. Mayr, T. Xie, T. Yu; Visiting Research Professor: F. Brglez; Adjunct Professor: A.W. Brown, B. Fortner, D.A. Reed; Adjuct Assistant Professors: A. Dagnino, A. Rindos, X. Wang; Lecturers: D.A. Lasher, J.L. Maners, C.S. Miller, T.E. Nelson Director of Multimedia Lab: D.H. Kekas; Director of Development & External Relations; K. Tate; Research Assistants: J.C. Bass; Associate Members of the Department: J.W. Baugh, Jr. (Civil Engineering), G.T. Byrd (Electrical and Computer Engineering), T.M. Cont (Electrical and Computer Engineering), A.G. Dean (Electrical and Computer Engineering), M. Devetsikiotis (Electrical and Computer Engineering), E. Kaltofen (Mathematics), G. Lazzi (Electrical and Computer Engineering), C.D. Meyer, Jr. (Mathematics), T.K. Miller (Distance Education and Learning Technology Applications), M.A. Rappa (Business Management), E. Rotenberg (Electrical and Computer Engineering), J.S. Scoggs (Mathematics), M.L. Sichitiu, (Electrical and Computer Engineering), W.E. Snyder (Electrical and Computer Engineering), Y. Solihin (Electrical and Computer Engineering), I. Viniotis (Electrical and Computer Engineering), W. Wang (Electrical and Computer Engineering).

Computers

Computers and computing are ubiquitous in modern society. The discipline of computer science has evolved during the past three decades with the expanding role of computers. New applications of computers continue to appear. They are used to design, manufacture and operate our automobiles, airplanes and spacecraft; to design our highways, bridges and buildings; to manage banking transactions; to help managers make decisions; to analyze farm production; to help the research scientist; and to monitor manufacturing processes and utilities. Computer science is the essential technology for information access and transfer.

Opportunities

Computer scientists have many career choices because of the diversity of computer use. A graduate may be involved in the design, implementation, or management of software systems or may adapt computers to new applications. Whatever ambitions and preferences the computer scientist might have, computer science offers opportunities pursuing an advanced degree, working in a team or alone, interacting frequently with people or not, working with tried and true systems or designing the latest technology.

Curriculum

This undergraduate curriculum leads to the degree of Bachelor of Science in Computer Science. The program is accredited by the Computer Science Accreditation Commission of the Computing Sciences Accreditation Board, a specialized accrediting body recognized by the Council on Postsecondary Accreditation and the U.S. Department of Education. Core courses provide the fundamentals of programming concepts, computer science theory, data structures, computer organization, operating systems, and software engineering. Restricted electives, chosen in consultation with one's adviser beginning in the junior year, allow exploration of specific computer science sub-areas such as database management systems, operating systems, graphics, multimedia technology, artificial intelligence, networks, computer-human interfaces and architecture. New areas include network and data security, data mining, and eCommerce, among others.

1. CSC students will be competent in theoretical and mathematical foundations of computer science. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. apply fundamental concepts of discrete mathematics such as logic & proofs, set theory, relations & functions, and combinatorics to model computational problems;
   b. demonstrate the application of abstract structures such as graphs, finite state machines, and recurrence relations to the solution of computer science problems; and
   c. analyze and evaluate comparative performance of algorithms and data structures appropriate to solving computer science problems.
2. CSC students will be able to construct algorithms and data structures applicable to problems solved by computer scientists. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. apply concepts related to data structures such as lists, stacks, queues, arrays, graphs, trees, heaps, and hashing to design and create algorithms; and
   b. recognize design patterns and use these to guide solutions to computer science problems.
3. Upon graduation, computer science students will be proficient in one programming language and have a basic knowledge of several others. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. write efficient solutions to specific problems using an object-oriented programming language;
   b. write programs in assembly language; and
   c. write programs in a procedural programming language.
4. CSC students will understand the hardware and software architecture of computer systems. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. define and explain instruction sets;
   b. explain the function and interaction of computer processing units, memories, and input/output devices;
   c. define and explain elements of operating systems such as memory management, process scheduling, synchronization and interaction, and input/output devices; and
   d. distinguish computer network elements and understand issues related to computer security.
5. CSC students will demonstrate the ability to participate in professional practices related to software engineering. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. negotiate, clarify, and document customer requirements;
   b. apply knowledge of fundamental algorithms, programming language concepts, and design patterns to determine an overall design for a software system;
   c. implement a fully specified system;
   d. test a fully specified system; and
   e. plan and monitor the progress of software projects to ensure on time delivery of a high-quality system.
6. CSC students will be able to communicate effectively about computer science-related topics. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. deliver an audience-sensitive oral technical presentation;
   b. write an audience-sensitive technical document; and
   c. contribute effectively on software-based system development teams.
7. CSC students will demonstrate the ability to be responsible practitioners of computer science and understand the social and ethical implications of computing. The outcomes associated with this objective are that, upon graduation, CSC students should be able to:
   a. demonstrate ways in which computers pose new ethical questions or pose new versions of standards, moral problems and dilemmas; and
   b. recognize and, when appropriate, to resolve ethical problems or dilemmas related to the computing profession.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

339 Engineering Graduate Research Center
phone: (919) 515-2336

R. J. Trew, Head and Alton and Mildred Lancaster Distinguished Professor of Electrical and Computer Engineering
I. Viniotis, Associate Head
H. J. Trussell, Director of Graduate Programs
C. W. Townsend, Coordinator of Advising

Distinguished University Professor: B.J. Baliga; Distinguished Professor of Electrical and Computer Engineering: J.R. Hauser, N.A. Masnari; Professors: W.E. Alexander, S.M. Bedair, G.L. Bilbro, M.Y. Chow, T.M. Conte, M. Devetsikiotis, A. Duel-Hallen,

P.D. Franzon, J.J. Grainger, E. Grant, A.Q. Huang, B.L. Hughes, K.W. Kim, R.M. Kolbas, A.H. Krim, G. Lazzi, L. Lunardi, V. Misra, T.K. Miller, H.T. Nagle, A.A. Nilson, C.M. Osburn, M.C. Ozturk, W.E. Snyder, M.B. Steer, J.K. Townsend, H.J. Trussell, I. Viniotis; Named Professor Emeritus: D.R. Rhodes; Professors Emeriti: T.H. Gilsson, A.J. Goetze, M.A. Littlejohn, J.B. O'Neal, Jr., A. Reismann, J.J. Wortman; Associate Professors: S.T. Alexander, M.E. Baran, G.T. Byrd, A.J. Dean, W.W. Edmonson, J.F. Muth, E. Rotenberg, M.W. White; Associate Professor Emeritus: G.F. Bland, W.T. Easter, W.C. Peterson; Assistant Professor Emeritus: L.R. Herman; Assistant Professors: D. W. Barlage, S. Bhattacharya, H. Dai, W.R. Davis, M. Escuti, D.Y. Eun, K. Gard, M. Ghovanloo, X. Liu, S. Sair, M. Sichitiu, Y. Solihin, W. Wang; Visiting Professor: J. Mink; Teaching Associate Professors: J.J. Brickley, Jr., H.O. Ozturk, S.J. Walsh, D.G. Yu; Research Professors: J. Chang, W.C. Holton, J.F. Schetzina; Research Assistant Professor: N. Biswas, A.A. Kiselev, P. Zhao; Lecturers: C. Gordon, B.J. Greene, C.W. Townsend; Adjunct Professor: R.K. Cavin, W.E. Cohen, D. Halchin, R.C. Luo, P. Rastgoufard, M.A. Stroscio, R.J. Ulman, D.L. Woolard, J.M. Zavada; Adjunct Associate Professors: D.J. Bradley, S.S. Lee, N.C. Strole, Adjunct Assistant Professor: T.M. Bradicich, W.J. Chimiak, R.J. Evans, E.W. Fulp, D.W. Hislop, F.Y. Jou, R.T. Kuehn, K.J. Molnar, A.S. Morris, A.J. Montalvo, D. Nackashi, J. Nath, D. Novosel, R.O. Onvural, A.J. Rindos, J.C. Sutton, J.M. Wilson; Adjunct Lecturer: W.J. Sliva; Interinstitutional Adjunct: J. Brock, Laboratory Supervisor: J.N. O'Sullivan, Associate Members of the Department: D. Bitzer (Computer Science), E. Davis (Computer Science), J. Herkert (Multidisciplinary Studies), W. Jasper (Textiles), G. Lucovsky (Physics), D. McAllister (Computer Science), J. Narayan (Materials Science and Engineering), H. Perros (Computer Science), W. Robbins (Computer Science), J.M. Stallman (Computer Science), M. Vouk (Computer Science)

The professions of electrical engineering and computer engineering are concerned with the analysis, design, construction and testing of systems based on electrical phenomena. In contemporary society, electrical methods are used to communicate and store information, control equipment and systems, perform mathematical operations, and convert energy from one form to another. Frequently, two or more of these functions are important in the design of systems such as television, radio, telecommunications, computer, robots and intelligent machines, telemetry systems, solid-state electronics, vehicle safety systems, biomedical devices, environmental controls, electric machinery, and electric power generation and transmission facilities.

Computer engineering is a field in which digital techniques are used in system design. Low-cost solid-state microprocessors and memories permit computers to be widely incorporated in many different types of devices from toys to traffic control systems. To work effectively in this rapidly growing field, the computer engineer must understand both hardware and software techniques and must effectively use both in order to design, build and test complex digital systems. Both the electrical engineering and the computer engineering programs, which lead respectively to the degrees, Bachelor of Science in Electrical Engineering and Bachelor of Science in Computer Engineering, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Program educational objectives of Electrical and Computer Engineering are:

1. Graduates utilize mathematics, science and engineering to identify, formulate, analyze and solve electrical and computer engineering problems. By engineering, we mean the skills, tools, and experimental techniques involved in the practice of engineering.
2. Graduates design electrical and computer systems, components and processes to meet desired needs. This objective includes the ability to work effectively on interdisciplinary teams and to communicate effectively with team members to achieve design objectives.
3. Graduates engage in lifelong learning in their profession as well as in contemporary issues of importance to the communities in which they live and work.
4. Graduates exercise professional and ethical responsibility, and have the broad education necessary to understand the impact of engineering solutions in a global and societal context.

Scholarships and Awards

Superior academic performance is recognized within this department in three ways: election of students to membership in the electrical engineering honor society, Eta Kappa Nu; awarding merit scholarships; and presentation of awards to outstanding seniors. The department has one endowed merit scholarship for rising sophomores, the Eugene C. and Winifred Sakshaug Scholarship, and sixteen endowed scholarships which are usually awarded to juniors and seniors: William E. Clark, Elizabeth P. Cockrell, Eugene C. Denton, Virginia Stewart Easter Memorial,William and Tipton Gray, John and Ann Hauser, Llewellyn Hewett, William and Carol Highfill, L. A. Mahler, Amelia N. Mitta, Frank T. Pankotay, Ronald G. Pendred, Pratt Family, William DeRosset Scott III, E. Chester Seewald, Fredrick J. Tischer, Herbert B. Walker, Simon B. Woolard, North Carolina Electric Membership Corporation, and William D. Stevenson, Jr., the latter two of which are for students studying electric power systems. The department also from time to time has scholarships provided by industrial organizations such as Square D, Duke Power, Progress Energy, Northrup Grumman, Cisco and Boeing. Academic merit is generally the primary requirement for these awards, but other characteristics, such as demonstrated leadership, may also be specified. In addition, the endowed William M. Cates Scholarship Program provides multiple scholarships for students having documented financial need and high academic performance. These are awarded each fall to juniors, with provision for continuation in the senior year.

Facilities

Many courses are accompanied by coordinated laboratory work and projects. These assignments typically focus on real-world systems and problems and involve computer simulation and analysis, design, development and testing of hardware and software associated with electrical, electronic, and electromechanical systems, circuits, and devices. Extensive facilities are provided for experimental study of analog and digital circuits, microprocessors, computers, VLSI devices, robots and intelligent machines and telecommunications. The William F. Troxler Design Center, 2,700 square feet senior design laboratory, provides resources for many required industry-sponsored, semester-long design projects. In all, the Department of Electrical and Computer Engineering maintains 14 teaching labs, all located in the newly constructed Engineering Building II on Centennial Campus. These labs provide students with state-of-the-art equipment designed to teach the students many practical, industry sought skills. Approximately 160 computers and a variety of other equipment— oscilloscopes, multimeters, power supplies, and function generators— are in use by the students on a daily basis. In addition, Engineering Building II houses a public lab of over 80 computers running a variety of operating systems and industry standard software. This lab is available to all engineering students and is staffed by trained student operators. A student-owned laptop platform has been developed in the College of Engineering. Combined with a comprehensive wireless network and many remote computer services this program allows education to expand outside of traditional classroom and laboratory facilities.

Core Courses

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Many of the core courses are offered three times a year in fall, spring, and summer. A strong emphasis is placed on fundamental concepts in core courses, so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years by additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, electromagnetics, and linear systems. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have required senior design project courses which give students comprehensive experience in designing, building, and testing physical systems.

Curricula

In addition to the core courses described above, students in the electrical engineering curriculum take seven specialization electives in areas of their choice within the discipline and two technical electives, which are selected engineering courses offered by other departments. Beyond the core, students in the computer engineering curriculum take courses in discrete mathematics, data structures, embedded systems, and complex digital systems, in addition to four specialization electives in areas of their choice and one technical elective. For both curricula, a variety of elective courses are offered in communications, computational intelligence, controls, digital signal processing, digital systems, mechatronics, microelectronics, networking robotics, and VLSI design. There are typically a dozen or more of these courses offered each fall and spring semester and two or three available each summer.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

INDIVIDUALIZED DEGREE PROGRAM IN ENGINEERING

Page Hall, Room 118
phone: (919) 515-2315

The B.S. in Engineering degree offers an individualized academic program for those exceptional students who have academic and career goals that cannot be accommodated by the other engineering degree programs. Before being admitted into the program, students must complete the freshman year, and have at least a 2.5 grade point average, have completed the requirements for admission into an engineering degree program and have a plan of study approved. For more information, contact the Assistant Dean for Academic Affairs at (919) 515-2315.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

BACHELOR OF SCIENCE IN ENGINEERING - MECHATRONICS CONCENTRATION

Joint Degree with University of North Carolina at Asheville
phone: (828) 251-6640, website: www.unca.edu/ncsu_engr/

Y. Fahmy, Program Director
C. Alderman, Associate Director
R. Bruce, Associate Director

The Joint Mechatronics Engineering curriculum (JEM) combines the best that two nationally recognized universities have to offer. From NC State University comes the engineering component comprising course work from the Departments of Mechanical and Aerospace Engineering (MAE), Electrical and Computer Engineering (ECE), and mechatronics courses taught by NC State University faculty on the campus of the University of North Carolina at Asheville. Hands-on laboratories are integral to the engineering course work. From the University of North Carolina at Asheville comes an engineering-themed Humanities and Social Science component with a rich liberal arts foundation.

Mechatronics engineering focuses on the precision control of mechanical and machine systems. In today's modern engineering systems, control is achieved electronically through sensors, actuators and microprocessors. The marriage of modern control systems

with mechanical devices is key to the design and development of high-performance engineering systems. Just a few examples of computer-controlled mechanical systems are robots, engine-fuel systems, hybrid automobiles, autonomous aerospace vehicles, stair-climbing wheelchairs, garage door openers and alternative power generation systems. Through modern mechatronics engineering, new avenues of thinking and design can greatly enhance the utility, performance, and efficiency of modern machinery.

The educational objectives of the Bachelor of Science in Engineering - Mechatronics concentration are:

1. To produce graduates who are able to apply the principles of mathematics, science, and engineering fundamentals, especially multi-disciplinary knowledge and skills in mechanical, electrical and computer engineering and who are able to design mechatronic components and systems to meet desired needs so they are prepared for successful careers in engineering or graduate school.
2. To produce graduates who are skilled at integrating and applying systems or devices incorporating modern microelectronics, information technologies and modern engineering tools for product design, development and manufacturing.
3. To produce graduates who possess professional interaction and program management skills, who communicate effectively with team members and demonstrate the ability to work effectively on multi-disciplinary teams to achieve design and project objectives.
4. To produce graduates who are able to define, analyze and solve problems, especially those involving integrated mechatronic devices and systems and who are capable of developing, implementing and evaluating solutions via integration of their basic scientific skills, knowledge and creative thinking strategies in a quality committed environment.
5. To produce graduates who are able to understand and demonstrate their responsibility to their profession and society in a global, ethical and contemporary context and who are prepared for and realize the importance of life long learning.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

EDWARD P. FITTS DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING

Daniels Hall, Room 400
phone: (919) 515-2362
website: www.ise.ncsu.edu

J. R. Wilson, Head
C. L. Smith, Assistant Head and Director of Undergraduate Programs
G. A. Mirka, Associate Head and Director of Graduate Programs

Henry A. Foscue Professor: C.T. Culbreth; University Professor: S.E. Elmaghraby; Walter Clark Professor: S.C. Fang; James T. Ryan Professor: T.J. Hodgson; Professors: M.A. Ayoub, R.H. Bernard, X. Chao, Y. Fathi, R.E. King, Y.S. Lee, G.A. Mirka, S.D. Roberts, J.R. Wilson, R.E. Young; Professors Emeriti: J.R. Canada, W.L. Meier, H.L. Nuttle, R.G. Pearson, A.L. Prak, W.A. Smith, Jr.; Associate Professors: D.R. Cormier, S.M. Hsiang, D.B. Kaber, M.G. Kay, E.T. Sanii; Assistant Professor: O.L.A. Harrysson; Lecturers: C.S. Alderman, J.C. Low, C.L. Smith

The Edward P. Fitts Department of Industrial and Systems Engineering offers an undergraduate B.S. program in Industrial Engineering. Four areas of educational focus are provided under this program: operations research, production systems, ergonomics and manufacturing. Additionally, a BSIE Furniture Manufacturing degree track is offered as an accredited specialization within the standard BSIE. In a cooperative effort of faculty representing all focus areas, the following undergraduate educational objectives were developed.

The educational objectives of this department are:

1. To actively recruit and retain qualified students and to prepare those students for entry into successful employment as industrial engineers in industry, service, consulting, and/or government organizations or for advanced study at leading graduate schools in engineering, business, management, or other technical or non-technical fields.
2. To educate students in a broad range of areas related to effective and established engineering practice, including engineering design, physical as well as engineering sciences, mathematics, information technology, and analytical problem solving.
3. To encourage students to pursue meaningful work experiences through cooperative education and internships and through course practicum/project experiences and to provide students the tool of systems and management engineering, preparing them for the professional and ethical management of people, processes, systems, and products in a wide variety of settings.
4. To encourage teamwork skills, particularly the ability to work with people from other fields in integrated engineering teams and the leadership skills for maximizing the performance of those teams.
5. To offer a curriculum that encourages students to become broadly educated engineers and life-long learners with an understanding and appreciation of the arts, humanities, and social sciences, an ability to communicate effectively with various audiences and purposes, and a desire to seek out further educational opportunities.
6. To expose students to advances in engineering practice and research as preparation for opportunities in graduate education.
7. To obtain resources necessary to recruit, develop, and retain faculty, laboratory, teaching and research assistants, and other support staff who are committed to the educational mission of the department and to acquire, maintain, and operate facilities and laboratory equipment appropriate to our engineering program.

The Bachelor of Science in Industrial Engineering, Furniture Manufacturing prepares graduates for both engineering and managerial positions in the furniture industry. The furniture industry is one of the largest industries in North Carolina. The curriculum offers industrial engineering students a concentrated study of the materials, products, and processes of the furniture industry.

The Bachelor of Science in Industrial Engineering (as well as the optional Bachelor of Science in Industrial Engineering, Furniture Manufacturing) is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; phone: (410) 347-7700.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Industrial Engineering

The minor in Industrial Engineering is designed to provide undergraduate engineering students and other science majors in curricula other than Industrial Engineering with the fundamentals of industrial engineering necessary for advanced study in the discipline and/or employment in industrial engineering to acquire some level of expertise in areas common to all industrial engineers as well as a deeper knowledge in at least one specific area of interest.

Admissions and Certification of Minor
Students should contact Clarence Smith, 407 Daniels Hall, (919) 515-6416, clarence_smith@ncsu.edu for admission to and certification of the minor in Industrial Engineering. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in 432 Daniels Hall and should be completed no later than during the registration period for the student's final semester at NC State.

Minor in Furniture Manufacturing

The minor in Furniture Manufacturing is open to all undergraduate degree students at NC State who are interested in gaining specialized knowledge of furniture product engineering and related manufacturing processes and design. A set of four cohesive courses provides for a concentrated study of this manufacturing industry as well as the application of industrial engineering fundamentals.

Admissions and Certification of Minor
Students should contact Clarence Smith, 407 Daniels Hall, (919) 515-6416, clarence_smith@ncsu.edu for admission to and certification of the minor in Furniture Manufacturing. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in 432 Daniels Hall and should be completed no later than during the registration period for the student's final semester at NC State.

Accelerated Baccalaureate/Masters (ABM) Program

This program will allow exceptional undergraduate students to complete both undergraduate and graduate degrees at an accelerated pace. The student is allowed up to 12 credit hours to be counted towards both the undergraduate and graduate degrees.

Requirements:

- Have completed a minimum of 75 credit hours and up to a maximum of 96 credit hours by the end of the current semester (includes transfer credits).
- Earned a GPA of at least 3.5 for all courses and 3.5 for all Industrial Engineering courses.
- Satisfied all prerequisite requirements for 400 level courses.
- A letter of recommendation from the undergraduate teaching adviser identifying the applicant as a participant in the ABM program should accompany the application as well as the course numbers and titles of the 12 credit hours to be used for both the bachelor's and master's degree programs.

Whether in the traditional B.S. or combined B.S.-MIE/MSIE, ABET and university requirements will be satisfied based upon the four (4) year curriculum.

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Engineering Building 1, Room 3002
phone: (919) 515-2377
website: www.mse.ncsu.edu

J. M. Rigsbee, Head
C. C. Koch, Associate Head
R. O. Scattergood, Director of Graduate Programs
C. M. Balik, Director of Undergraduate Programs

Distinguished Research Professors: J.J. Cuomo, J. Narayan; Professors: C.M. Balik, D.W. Brenner, N. El-Masry, A.I. Kingon, C.C. Koch, K.L. Murty, J.M. Rigsbee, G.A. Rozgonyi, P.E. Russell, R.O. Scattergood, Z. Sitar, R.J. Spontak; Associate Professor: G. Duscher, J. Kasichainula, J.P. Maria; Assistant Professors: M. Johnson, M. Luo; Professors Emeriti: K. Bachmann, R.B. Benson, Jr., H. Conrad, R.F. Davis, A.A. Fahmy, J.J. Hren, H. Palmour III, H.H. Stadelmaier; Teaching Professor: K. Dawes; Teaching Associate Professor: Y. Fahmy; Adjunct Faculty: D.J. Herr, P.G. Kotula, S. Mueller, J.T. Prater, R. Reeber, J. Russ, E. Segan, F. Shimura, V. Zhirnov; Associate Members of the Faculty: D. Aspnes (Physics), J.A. Bailey (Mechanical and Aerospace Engineering), S.M. Bedair (Electrical and Computer Engineering), K.S. Havner (Professor of Civil Engineering), H. Lamb (Chemical Engineering), G. Lucovsky (Physics), R.J. Nemanich (Physics), G. Parsons (Chemical Engineering), I. Rovner (Sociology and Anthropology); Inter-institutional Adjunct Faculty: J. Sankar (NC A&T State University)

The Department of Materials Science and Engineering offers programs to qualify graduates for positions in industry, R & D laboratories, educational institutions and governmental agencies. This basic education involves design, development selection and processing of engineered materials. Industries served by graduates in materials science and engineering are aerospace, automotive, chemical and chemical processing, communications, electronics, energy production, manufacturing, nuclear and transportation. This program has been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202; phone: (410) 347-7700.

The MSE program at NCSU prepares their B.S. graduates to achieve the following career and professional goals:

- To apply their basic MSE knowledge and skills to problems and challenges encountered in their professional careers.
- To use modern analytical equipment and methods as needed for materials testing, design, processing, development and research.
- To communicate well, orally and in writing, interact professionally and work effectively on multidisciplinary teams to achieve design and project objectives.
- To engage in lifelong learning in their profession and practice professional and ethical responsibility.

Opportunities

The continuing industrial and technological growth of the United States, the southeast region, and the state of North Carolina has been marked by a particularly strong and increasing demand for materials engineers and scientists. Modern technological advances require new materials and novel processing and/or fabrication methods. At the national level, materials research is prominently mentioned in most lists of critical or enabling technologies. As our understanding of materials science advances, common features and elements tend to unite many different industries. As an example, consider that our current knowledge of silicon is necessary in the electronics, photovoltaics, optical fiber technologies, lasers, pollution control, and biomedical industries. Advanced understanding of polymers also crosses and unites several different industries such as plastics, textiles, electronics, biomaterials and recycling.

Education in materials science and engineering provides career opportunities in a wide range of industries from those that produce and/or use metals, glass, polymers, or ceramics, to those which use such materials in an integrated fashion such as the microelectronics industry. These opportunities include careers in research and development of new materials, new processes for producing them, failure analysis, product design and reliability, and technical management at all levels of business. The importance and growth potential of the materials science and engineering discipline is reflected by a recent U.S. Department of Labor study which predicts that over the next decade the demand for materials engineers and scientists will exceed that of any other engineering discipline.

Curricula

The materials scientist and engineer must understand the wide range of phenomena that occur in all classes of materials: metals, polymers, composites, and electronic materials. The undergraduate curriculum is designed to provide balance by addressing the scientific and engineering principles applicable to all classes of materials as well as the particular engineering and design concepts unique to each class of material. Further emphasis in a specific area is provided by choosing technical electives dealing with processing and specific applications of metallic, ceramic, polymeric, semiconducting or composite materials. The required senior design capstone courses (MSE 423-424) provide a strong preparation for dealing with real-world industrial situations. MSE 423 covers open-ended classroom exercises and involvement in group dynamics and proposal preparation. MSE 424 provides direct involvement with an industrial sponsor working on real problems submitted by industry. The remaining required courses are distributed among mathematics, physical sciences, and the humanities and social sciences.

The materials science and engineering program, which is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), leads to the degree Bachelor of Science in Materials Science and Engineering. An accelerated 5-year BS/MS program is available for advanced study and further specialization. Graduate degrees are also offered (consult the *Graduate Catalog*).

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Materials Science and Engineering

The Materials Science and Engineering minor requires 11 hours of core MSE courses and 6 hours of MSE electives. It is designed to provide undergraduate engineering and science majors in curricula other than MSE with the fundamentals of modern materials science and engineering. The Minor in Materials Science and Engineering provides instruction in basic principles and a concentration in areas of interest including ceramic, polymeric, metallic or microelectronic materials. A cumulative GPA of 2.0 or higher is required in the minor courses. Futher information regarding a Minor in Materials Science and Engineering is available from the Director of Undergraduate Programs.

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

Broughton Hall, Room 3211
phone: (919) 515-2365
website: www.mae.ncsu.edu

R. D. Gould, Professor and Interim Department Head
R. T. Nagel, Professor, Associate Department Head, and Director of Graduate Programs

E. C. Klang, Assoc. Professor and Director of Undergraduate Programs
C. M. Tran, Lecturer and Director of Undergraduate Advising and Curricula
C. Heeter, Director of Undergraduate Scheduling, Outreach, and Assessment

Alumni Distinguished Undergraduate Professors: E.M. Afify, M.A. Boles; Alumni Distinguished Graduate Professors: F.R. DeJarnette, H.A. Hassan; Duncan Chaired Professor: T.A. Dow; Professors: J.R. Edwards, Jr., R.F. Keltie, C. Kleinstreuer, J.W. Leach, D.S. McRae, P.I. Ro, W.L. Roberts, L.M. Silverberg, J.S. Strenkowski, J. Tu, F.G. Yuan, M.A. Zikry; Professor and Senior Extension Specialist: H.M. Eckerlin; Research Professor: R. Tolson; Adjunct Professor: T. Scharton; Professors Emeriti: J.A. Bailey, J.A. Edwards, F.J. Hale, F. D. Hart, T.H. Hodgson, R.R. Johnson, C.J. Maday, J.C. Mulligan, M.N. Ozisik, J.N. Perkins, L.H. Royster, F.O. Smetana, F.Y. Sorrell, C.F. Zorowski; Associate Professors: G.D. Buckner, T. Echekki, J.W. Eischen, A. Gopalarathnam, C.E. Hall, Jr., A.V. Kuznetsov, K.M. Lyons, A. Mazzoleni, K.J. Peters, M.K. Ramasubramanian, S. Seelecke, F. Wu; Adjunct Associate Professor: P.B. Corson; Assistant Professors: N. Ma, G Ngaile, A. Rabiei, T. Zeng; Teaching Assistant Professor: A. Howard; Senior Lecturer: T. Clements; Lecturers: T. Gilbert, S.N. Heinzen; Lecturers Emeriti: G.O. Batton, A. Boyers, R. Leuba; Researcher and Extension Specialist: S.D. Terry

Aerospace engineering is the application of science and engineering principles to the design, development, and implementation of systems or vehicles that travel above the surface of the earth. The vehicles may include a variety of aircraft and spacecraft such as low-speed propeller-powered aircraft, high-speed jet-powered aircraft, remotely piloted vehicles, micro air vehicles, hovercraft, and helicopters, along with space related vehicles and systems that include rockets, spacecraft, space stations, planetary rovers, and various specialty equipment such as heat shields, and other protective and deployment devices. The design of these vehicles and systems is both difficult and challenging because they must operate reliably and efficiently in harsh environments. Aerospace engineering is intimately involved in the design, manufacture, control, and operation of these systems coupled with a consideration of environmental, economical, ethical, and social issues.

Mechanical engineering involves the practical application of mechanical and thermal sciences to researching, designing, development, testing, and manufacturing of a wide variety of products. The diverse areas to which mechanical engineers contribute include transportation, power generation and energy conversion, environmental control and pollution abatement, noise control, and biomechanics. Recent developments have increased interest in such areas as robotics, mechatronics, precision engineering, automated manufacturing systems, combustion, and propulsion. Student projects include Mini-Baja cars, and Formula SAE cars.

Aerospace: The aerospace engineering program is supported with laboratories where students obtain hands-on experience with state-of-the-art instrumentation and computers. Low-speed and high-speed wind tunnels and structural and material facilities are used for testing prototype models. A prominent feature of the program is the student's involvement in design, construction, and flight-testing of novel aircraft designs, a pedagogical device pioneered by the aerospace engineering program at NC State University. The spacecraft design involves construction and flight readiness testing of satellites and spacecraft. In addition, the program is supported by strong research activities and dedicated faculty who provide personalized attention to students.

Mechanical: The mechanical engineering program is comprehensive in that it consists of both analytical/numerical and experimental activities and laboratories. Computational facilities consist of three computer laboratories, using both SOLARIS and Windows NT platforms. Computational software available includes state-of-the-art mathematical and computer algebra software, as well as modern design and analysis tools. The experimental laboratories include measurements and data analysis, performance evaluation of thermal systems, and testing and analysis of mechanical components. The Senior Design Laboratory is jointly supported by the department and by the industry. This is a unique laboratory facility, which involves the students in solving actual industrial problems by designing, building, and testing prototype machines. The laboratory facilities are supported by a machine shop and an electronics facility. Also housed in the Mechanical Engineering Program are the Applied Energy Research Laboratory (AERL), the Precision Engineering Laboratory (PEC) and the Industrial Assessment Center (IAC).

Opportunities

Aerospace: The aerospace engineering undergraduate curriculum includes a variety of courses that provide the student with knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and vehicle stability and control plus knowledge of selected topics in orbital mechanics, space environment, attitude determination and control, telecommunications, space structures, and rocket propulsion. The program educates students to define, formulate, and solve aerospace engineering problems in aeronautics and astronautics, to function on multi-disciplinary teams, to communicate effectively and to integrate pertinent technical areas to meet a stated objective through the use of trade-off studies and compromises to satisfy the quality and integration objectives. In addition to aerospace industries and other industries with similar interests (such as automobile design), Aerospace Engineering graduates are typically employed by government laboratories such as NASA, NAVAIR, the Air Force and a wide variety of aerospace industries. Many of them also go to graduate school to pursue advanced degrees.

Mechanical: Because of the wide range of applications and needs, mechanical engineering is one of the broadest engineering disciplines, and thus offers a wide variety of employment opportunities. The mechanical engineering program provides students with the knowledge and experience that equip them to enter a wide field of functional areas, including design, development, manufacturing, plant operation, testing and experimentation, consulting, sales and service. Employment may readily be found in industry, government and service organizations. Students are also well prepared to enter graduate school to pursue advanced degrees in engineering, science or business, as well as professional degree programs such as medicine, accounting and law.

Curricula

Because of the close relationship between mechanical and aerospace engineering, both curricula are administered by the Department of Mechanical and Aerospace Engineering. The curricula are nearly the same for the freshman and sophomore years but quite

different for the junior and senior years. Each program is designed to provide the student with an understanding of both the science on which the discipline is founded and the applied science and technology which characterizes its specific applications. In addition, the programs provide students with opportunities to develop the skills necessary for applying their acquired knowledge. Both the aerospace engineering and the mechanical engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Graduate degrees are also offered (see *Graduate Catalog*).

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Educational Objectives

The objectives of the mechanical and aerospace engineering degree programs are the following:

- To prepare students to enter into successful careers in the mechanical or aerospace engineering professions, having acquired the knowledge and skills to analyze engineering problems and to engage in the creative engineering design process in the areas of thermal and mechanical systems or in the areas of aeronautics and astronautics.
- To have developed skills in the basic sciences, mathematics, engineering fundamentals, and engineering design that meet the standards of an education in mechanical and aerospace engineering and foster the concepts of integrated engineering teams.
- To have acquired the necessary skills to use the modern computational and experimental technologies of mechanical and aerospace engineering.
- To have the necessary background in humanities, social sciences, and contemporary issues to practice the mechanical and aerospace engineering profession ethically, responsibly, and with awareness of the impact of the engineering activity in a global and societal context.
- To have the exposure to theory and advances in engineering practice and research as preparation for opportunities in graduate education.
- To have developed the ability to communicate ideas effectively and the desire to seek out further educational opportunities for lifelong learning.

Honors Program in Mechanical and Aerospace Engineering

Students enter the ME or AE Honors Program by invitation. To qualify for admission, the student must have an overall 3.5 grade point average or better at the time of admission and complete a plan of work.

Students are recognized for having completed the honors program if they graduate with a 3.25 overall grade point average or better. Recognition for having completed the honors program is indicated on the student's transcript. It states on the transcript that the student has fulfilled the requirements of the honors program in the College of Engineering.

DEPARTMENT OF NUCLEAR ENGINEERING

Burlington Engineering Laboratories, Room 1110
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M.A. Bourham, Interim Head
J.M. Doster, Undergraduate Administrator
M. S. Yim, Director of Graduate Programs

Alumni Distinguished Undergraduate Professor: Associate Professor J.M. Doster; Alumni Distinguished Graduate Professors: Professors M.A. Bourham and R.P. Gardner; Professors: J.G Gilligan (Vice Chancellor for Research and Graduate Studies), K.L. Murty and P.J. Turinsky; Research Professor: B.W. Wehring; Professors Emeriti: D.J. Dudziak, T.S. Elleman, R.L. Murray, K. Verghese; Adjunct Professors: R.M. Lindstrom, D. McNelis, A. Sood, B. Wieland, M.S. Wechsler; Associate Professor: M.S. Yim; Associate Professor and Director of Nuclear Reactor Programs: A.I. Hawari; Assistant Professor: D. Anistratov; Teaching Assistant Professor: O.E. Hankins; Visiting Assistant Professor: H.S. Abdel-Khalik; Health Physicist: G.D. Wicks; Nuclear Services Manager: S. Lassell; Manager of Reactor and Engineering Operations: A. Cook; Director of Outreach Programs: L.M. Marshall

Nuclear engineering is concerned with the engineering aspects of the control, release, and utilization of nuclear energy from both fission and fusion. Nuclear reactors serve many functions: they serve as heat sources for electric power plants and are the basis of radioactive isotopes for a variety of peaceful applications. Nuclear methods are applied in medical diagnosis and treatment, scientific research, and the search for new resources. The nuclear engineering program educates individuals in scientific and engineering principles essential for effective and productive contributions in industrial, university and government service. The Department of Nuclear Engineering maintains its national undergraduate and graduate rankings on the top 10 among all nuclear engineering programs.

Opportunities

Nuclear power reactor operation continues with over one hundred reactors operating in the nation, increasing our reliance upon nuclear energy as a substitute for energy from fossil fuels. Development of advanced fission and fusion reactors offers the potential of vast new energy sources. Industrial and medical applications of radiation continue to increase in diverse industries. A demand for nuclear engineers exists within the electric power industry and national laboratories, naval reactors, and other industries. According

to the National Society of Professional Engineers, nuclear engineers are among the top four best compensated of the engineering disciplines.

Scholarships and Awards

Several special scholarships exist for NC State nuclear engineering students, including the Progress Energy, Duke Energy, Eastern Carolinas ANS, Piedmont ANS, Institute for Nuclear Power Operations, Department of Energy and American Nuclear Society scholarships. A special department fund supports scholarships for incoming freshmen and exceptional upperclassmen. NC State nuclear engineering students have received special recognition awards at the Undergraduate Research Symposium and have gained national recognition by several times receiving the Student Design Award of the American Nuclear Society. NC State nuclear engineering students are also frequent recipients of nationally awarded fellowships.

Facilities

Facilities for nuclear education include a nuclear research reactor (PULSTAR), which can be operated at a steady state power of 1 MW; radiation detectors and multi-channel analyzers; nuclear materials laboratory; thermal hydraulic laboratory; prompt gamma facility; neutron activation analysis laboratory; radio-chemistry laboratories; neutron radiography unit; positron facility; ultra cold neutron source; neutron diffractometer; numerous computer facilities including graphic terminals, departmental computer workstations, College of Engineering EOS engineering workstations, microcomputers; and reactor simulation laboratory plasma generation and diagnostics laboratory, atmospheric plasma science laboratory, and plasma launchers laboratory.

Mission

The Department of Nuclear Engineering has four primary missions, these being:

- Provide a quality education at both the undergraduate and graduate levels to students who desire to pursue careers in nuclear science and engineering;
- Develop research programs in areas of emphasis related to applications of nuclear science and engineering;
- Assist industries and government in North Carolina, nationally and internationally in their efforts to apply these nuclear technologies to the betterment of the economy and the environment - in a safe, effective, and innovative manner; and
- Enhance, promote, and utilize the PULSTAR research reactor and associated facilities in an exemplary manner, leading to national recognition as a premier 1 MW Nuclear Reactor Program dedicated to research, teaching, and extension.

Consistent with the Department of Nuclear Engineering's mission, the department has developed the following objectives for undergraduate education.

- To prepare students for successful careers in Nuclear Engineering, emphasizing the mastery of engineering fundamentals, the ability to solve engineering problems, and the creative process of engineering design.
- To instill in students an understanding of the professional and ethical responsibility to perform engineering tasks at a high level and to be accountable for the social and environmental impact of engineering practices.
- To establish an educational environment in which students participate in cross-disciplinary activities.
- To offer a curriculum that provides students the opportunity to become broadly educated engineers and life-long learners, with a solid background in the basic sciences, engineering sciences, and mathematics.
- To provide an understanding of, and an appreciation for, the humanities and the social sciences.
- To further provide the written and oral communication skills necessary for students to communicate effectively with a variety of audiences.
- To expose students to advances in engineering practice and research and to prepare them for opportunities in graduate and professional education.
- To attain the institutional support and financial resources to recruit, develop, and retain faculty who are committed to the educational and research mission of the department and to acquire, maintain, and operate facilities and laboratories appropriate to our engineering program.

Curriculum

Nuclear engineers work in nuclear systems research, design, development, testing, operation, environmental protection, and marketing. The Bachelor of Science program prepares graduates for positions in industry, national laboratories, or for graduate study (consult the *Graduate Catalog*). The curriculum incorporates basic sciences and engineering, with emphasis on mathematics and physics, followed by course work in nuclear science and technology. Design concepts are introduced in numerous nuclear engineering courses throughout the curriculum to provide an integrated educational experience, capstoned by senior nuclear projects involving reactors and radiation systems. Attention is also given to the efficient utilization of energy resources and to the environmental aspects of nuclear energy. Computers are widely used throughout the curriculum.

The nuclear engineering program, which is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), leads to the degree of Bachelor of Science in Nuclear Engineering. Advanced undergraduates who desire to attend graduate school at NC State and specialize in the areas of Fission, Fusion/Plasma, or Radiological Engineering may enter a combined 5-year B.S./MNE professional program or B.S./M.S. bachelor/master degree program during their senior year which will culminate at the end of their fifth year with both the Bachelor of Science in Nuclear Engineering and the Master of Nuclear Engineering or the Master of Science degrees.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

PAPER SCIENCE AND ENGINEERING PROGRAM

Biltmore Hall, Room 2105
phone: (919) 515-5807

S. S. Kelley, Head
R. A. Venditti, Director of Graduate Programs
M. V. Byrd, Undergraduate Coordinator, Paper Science and Engineering
P. N. Peralta, Undergraduate Coordinator, Wood Products

Alumni Distinguished Undergraduate Professors: H. Jameel, J.A Heitmann, Jr.; Alumni Distinguished Graduate Professor and Elis & Signe Olsson Professor: H. Jameel; Buckman Distinguished Scientist: M.A. Hubbe; Professors: D. Argyropoulos, J. Denig, J.A. Heitmann, Jr., H. Jameel, S.S. Kelley, A.G. Kirkman, M.J. Kocurek; Research Professors: R.L. Lemaster, J.S. Stewart; Professors Emeriti: A.C. Barefoot, H.M. Chang, E.L. Deal, E.L. Ellwood, I.S. Goldstein, C.A. Hart, R.G. Hitchings, L.G. Jahn, M.W. Kelly, H.G. Olf, R.G. Pearson, R.J. Thompson, E.A. Wheeler; Adjunct Professors: S. Banerjee, L.L. Edwards, H.L. Hergert, B. Kasal, R. B. Phillips, J.J. Renard; Associate Professors: M.A. Hubbe, L.A. Lucia, P.H. Mitchell, P.N. Peralta, I.S. Peszlen, O.J. Rojas, R.A. Venditti; Adjunct Associate Professors: A.G. Raymond, J. W. Skowronski, H.A. Stewart, J. Wiedenbeck; Associate Professors Emeriti: R.C. Allison, R.C. Gilmore, S.J. Hanover; Assistant Professors: M.V. Byrd, J.J. Pawlak; Adjunct Assistant Professors: S. Zauscher.; Research Assistant: W.S. Bryan

The wood-based industry of North Carolina, as well as throughout the South, is a vital part of the nation's economy. In terms of the dollar value of shipments of wood and paper products, the South leads all regions of the country. North Carolina manufactures more wood household furniture than any other state, ranks third in shipment value for all wood and paper products, and is second in the number of employees and wages paid. Thus, many opportunities exist in North Carolina and other southern states for careers in the wood-based industry.

The Department of Wood and Paper Science offers two curricula leading to Bachelor of Science degrees- Paper Science and Engineering, and Wood Products. Both curricula prepare men and women for careers in the wood, paper, and allied industries or in government agencies connected with wood resources.

Curricula in Paper Science and Engineering

M. V. Byrd, Undergraduate Coordinator

The Paper Science and Engineering curriculum prepares students for careers in the paper industry, which ranks as the fifth-largest manufacturing industry in the United States. Science, engineering, and mathematics form the basis for a multidisciplinary approach to understanding the fundamental manufacturing principles involved. Students study the technology and engineering of wood pulping processes, chemical and by-product recovery systems, and pulp bleaching. In addition, various paper making operations, such as refining, sizing, coating, and drying are studied. These topics along with the chemistry of wood, pulping, and paper making, and the physics of paper as it relates to product characteristics and design form a fundamental core of courses that all students in the curriculum take.

Two concentrations are available emphasizing the different engineering aspects of pulping and paper making. The Paper Science and Engineering concentration provides an extensive background in the pulp and paper manufacturing processes and elective credit hours for studies in chemistry, marketing, economics, management or other areas of interest to the student. Greater depth in general chemical engineering principles can be obtained from the Chemical Engineering Concentration. Students who have completed the Chemical Engineering Concentration in Paper Science and Engineering can, in cooperation with the College of Engineering and with an additional semester of study, earn a Bachelor of Science in Chemical Engineering as a second degree.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Program Educational Objectives

The Paper Science and Engineering program strives to produce graduates that will be recognized by the following attributes as they work in the industry:

- They have mastery of the fundamentals of physical, mathematical and engineering sciences, analytical problem solving, engineering, experimentation and design, and information technology;
- They can grasp and apply engineering and scientific principles and procedures to solve complex, real-world problems;
- They understand the economic, social and environmental implications of their decisions;
- They are able to communicate effectively for various audiences and purposes;
- They participate in intra-group and cross-functional teams to solve technical, non-technical and broader business issues;
- They have a wide perspective of the paper industry and its relationship to society;
- They possess a strong sense of professional responsibility, ethics, and awareness of people's needs as they function in industry;
- They continue their education and learning to maintain their technical skills;
- They have broadened their non-technical education to further enhance their job skills and aspects of their personal lives.

Opportunities

Graduates of this curriculum find opportunities for challenging careers as process engineers, product development engineers, process control engineers, chemists, technical service engineers, quality control supervisors, and production supervisors. Design and construction engineering companies employ graduates as project engineers, and pulp and paper machinery companies use their education and skills for technical service and sales positions. Opportunities for managerial and executive positions are available to graduates as they gain experience.

The broad and intensive nature of this curriculum makes graduates attractive not only to the pulp and paper industry, but also to a variety of other major chemical process industries. This appeal is especially true for the dual degree in Paper Science & Engineering and Chemical Engineering.

Summer Internship

All Paper Science and Engineering majors are required to work one summer in a pulp or paper manufacturing facility. One hour of academic credit is granted after completion of 12 weeks of this work and presentation of an engineering report of professional quality. In addition, students are urged to work in manufacturing facilities the other two summers, as the work provides valuable practical experience. Departmental advisers assist students in locating summer jobs, which are found throughout the US and some are even international.

Many Paper Science & Engineering students work at least one co-op rotation, in which they leave school for one semester and work in the industry. The resulting experience adds significantly to a student's desirability upon graduation.

Accredited Program

The Paper Science and Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Regional Program

The Paper Science and Engineering curriculum is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field.

Scholarships

Approximately 125 undergraduate academic scholarships are granted annually to new and continuing students by more than 50 companies comprising the Pulp and Paper Foundation.

Minor in Paper Science and Engineering

The Paper Science and Engineering Minor is available to all undergraduate students enrolled in the university as degree candidates except Paper Science and Engineering Majors. The minor requires 15 credit hours. Six hours of required courses provide a comprehensive overview of pulping and paper making science and technology, including pulping, bleaching, chemical recovery, recycled fibers, paper making, coating, printing, converting, and paper properties. Nine elective hours may be chosen from areas including wood chemistry, wet end chemistry, unit operations, process design and analysis, project management, paper physics, process control, or to gain more in depth exposure to the basic pulping, bleaching, and paper making process.

The Paper Science and Engineering Minor, with its focus on paper making science and technology, is intended to be especially valuable to students majoring in programs leading to careers in corporate or government positions which would interface with the paper and related industries. Students interested in business, scientific or engineering specialties, which may interface with, or are employed by these industries will find the minor especially useful.

Admissions and Certification of Minor
All undergraduate students enrolled in the university as a degree candidate, other than PSE majors, are eligible for admission to the PSE minor program. The PSE Minor Adviser will serve as adviser and certify completion of the minor. Paperwork for certification must be submitted to the minor adviser no later than the registration period for the student's final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate form his or her degree program. Contact Person: Dr. John Heitmann, Minor Adviser, 2111 Biltmore Hall, (919) 515-7711.

TEXTILE ENGINEERING PROGRAM

Textile Building/Centennial Campus, Room 3250

K. R. Beck, Head, Department of Textile Engineering, Chemistry and Science
J. P. Rust, Associate Head, Director of Undergraduate Programs
P. J. Hauser, Associate Head, Director of Graduate Programs

Burlington Industries Professor of Textile Technology: R.L. Barker; Ciba-Geigy Professor of Dyestuff Chemistry: H.S. Freeman; Kosa Professor of Fiber and Polymer Chemistry: A.E. Tonelli; Professors: K.R. Beck, T.G. Clapp, B.S. Gupta, H. Hamouda, P.J. Hauser, S.M. Hudson, W.J. Jasper, J.P. Rust; Adjunct Professors: A. Bogdanovich, D.J. Brunelle, L.D. Claxton, W.G. O'Neal, D.J. Prezant, D.J. Sikkema; Professors Emeriti: D. R. Buchanan, D.M. Cates, J.A. Cuculo, P.D. Emerson, P.L. Grady, D.S. Hamby,

S.P. Hersh, C.D. Livengood, P.R. Lord, R. McGregor, G.N. Mock, M.H. Mohamed, M.H. Theil, C. Tomasino, P.A. Tucker, W.K. Walsh, W.M. Whaley; Associate Professors: D. Hinks, J.A. Joines, R. Kotek, M.G. McCord, R. Shamey; Adjunct Associate Professors: E.S. Greenhalgh, J. Kaufman, R.G. Keuhni, T. Montgomery, I.D. Shin; Associate Professors Emeriti: T.G. Rochow; Assistant Professors: R.E. Gorga, W.E. Krause, M.A. Pasquinelli, X. Zhang; Adjunct Assistant Professors: H.A. Boyter, Jr., L. Dickinson, R.A.F. Moore, I. Parker, L. Qian, H.S. Whang; Adjunct Lecturers: S. Li, C. Moses; Associate Members of the Faculty: P. Banks-Lee, S.K. Batra, W. Oxenham, T.K. Ghosh, B. Pourdeyhimi, R.J. Spontak, R.E. Fornes (Physics)

The Textile Engineering (TE) Program at North Carolina State University is administered jointly by the College of Textiles and the College of Engineering and is an interdisciplinary curriculum drawing on diverse science and engineering principles. Textile engineering students develop a unique background, through undergraduate research, summer intern experiences, and design projects ranging from artificial blood vessel development to the design of novel high-tech sporting equipment. Textile engineers also design computer information systems that can integrate a worldwide distribution program eliminating a company's reliance on regional stockpiles or streamline an industrial process using Six Sigma quality saving a company millions of dollars. The program offers small class sizes with personal attention from faculty. With the focus on interdisciplinary research, the opportunities for textile engineers have never been brighter.

Opportunities

Textile engineers, teaming with chemists, physicists, materials scientists, and other engineers are designing new polymers, fibers, and textile structures to revolutionize the future of materials. Whether it be for personal protective garments such as bullet proof vests and Gore-tex® or materials used in the next generation space shuttle and the stealth bomber, textile engineers are developing products that are stronger, lighter, and more durable than current materials. Textile engineers are employed in a wide variety of industries that include aerospace, automotive, chemical, composites, management consulting, fiber processing, medical devices, manufacturing and retail, and textile processing.

The TE Program provides a fundamental engineering degree with a working knowledge of the very large textile industry as well as its allied industries. We have our own career planning and placement center to assist students in identifying and selecting internships and permanent careers. Historically, TE graduates have had nearly 100% placement into graduate school or full time employment with starting salaries among the highest at N.C. State University. Compared to the rest of North Carolina State University, the College of Textiles has the highest percentage of students participating in scholarship programs. Indeed, over 50% of all Textile Engineering students receive scholarship support! Owing to the size of the program, many of our undergraduate students participate in research with our world renowned faculty further providing financial assistance as well as professional growth. Almost all of our textile engineering students participate in summer internships. Many of our graduates select jobs that are located in the Southeast, but others who desire to work in other regions of the country have opportunities to do so. Our graduates work in the biomedical industries on the east and west coasts and in Chicago, the automotive industry in Michigan, the aerospace industry in Texas, as well as large apparel and retail companies in Ohio and North Carolina.

Curriculum

The TE program has three concentrations allowing a customized curriculum that fits your specific educational goals. All three programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The concentrations emphasize Information Systems Design, Chemical Processing and Product Engineering. Minors in associated engineering fields (e.g., Computer Science, Industrial Engineering, and Materials Science) as well as foreign language minors are strongly encouraged as part of the academic plan. For exceptional students, dual degree programs with Chemical and Biomolecular Engineering, Biomedical Engineering, and Materials Science and Engineering provide a bachelor degree in two engineering majors with one additional semester of course work.

Educational Objectives

Consistent with this mission, and in order to prepare our students for successful careers and lives, the Textile Engineering Program of the Department of Textile Engineering, Chemistry and Science maintains a strong academic program with the following educational objectives. A graduate of the Textile Engineering Program should:

1. possess a solid foundation in basic science, mathematics, and engineering science and demonstrate the ability to apply this knowledge to the solution of problems.
2. have practice in and demonstrate the ability to design and develop useful products, processes, machines, and/or systems.
3. have practice in and demonstrate the ability to use modern tools of engineering to solve problems.
4. have practice in designing and conducting experiments and analyzing and interpreting data related to problem solving in the areas encompassed by textile engineering.
5. have practice in teamwork, understand how to help a team operate effectively, and appreciate the value of diversity in team-based problem solving.
6. possess an appreciation for and commitment to life-long learning, and an ability to adapt and to change.
7. understand the importance of integrity and ethics in engineering practice and in life.
8. have practice in written and oral communication, and demonstrate the ability to communicate effectively.
9. demonstrate an awareness of the global nature of the textile industry and the modern world.
10. have a broad educational experience enabling them to pursue careers within or outside of textile engineering.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

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Raleigh, NC 27695-8101
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College of Humanities and Social Sciences

The College of Humanities and Social Sciences offers programs of study which lead to baccalaureate and advanced degrees in the disciplines of the humanities and social sciences. The college also offers courses in these disciplines that are required in all undergraduate programs. In this way the university provides its students the opportunity to prepare for a full life in the professions and occupations that require intellectual flexibility, broad knowledge, and a basic comprehension of human beings and their problems.

CHASS is comprised of nine departments or schools: Communication, English, Foreign Languages and Literatures, History, Philosophy and Religion, School of Public and International Affairs, Psychology, Social Work, and Sociology and Anthropology (also a department in the College of Agriculture and Life Sciences). Interdisciplinary programs are administered through Academic Affairs in the CHASS Dean's Office.

The college offers undergraduate majors in: Africana studies; anthropology; arts applications; communication; criminology; English; French; history; interdisciplinary studies; international studies; philosophy; political science; psychology; religious studies; science, technology and society; social work; sociology; Spanish; and women's and gender studies. In addition, special options or concentrations are available within some of the major programs:

Anthropology

Applied Anthropology

Bioarchaeology

Communication

Communication Media

Public & Interpersonal Communication

Public Relations

English

Creative Writing

Film

Language & Literature

Language, Writing and Rhetoric

Teacher Education

World Literature

Philosophy

Philosophy of Law

Political Science

American Politics

International Politics

Law and Justice

Public Policy

Social Studies Teacher Education

Psychology

Human Resource Development

A Teacher Education Option is available in English, French, Spanish, and social studies (history, political science and sociology). Degrees granted include the Bachelor of Arts, Bachelor of Science, Bachelor of Social Work, Master of Arts, Master of Fine Arts, Master of Science, and Doctor of Philosophy, as well as professional degrees in political science and sociology.

Academic Minors

The College of Humanities and Social Sciences offers 38 minors:

Africana Studies
American Literature
Anthropology
Arts Studies
Chinese Studies
Classical Greek
Classical Studies
Cognitive Science
Creative Writing
Criminology
English
Film Studies
French
German
Health, Medicine & Human Values
History
International Studies
Italian Studies
Japan Studies
Japanese
Journalism
Law and Justice
Linguistics
Music
Nonprofit Studies
Philosophy
Political Science
Psychology
Religions Studies
Russian Studies
Science, Technology, and Society
Social Work
Sociology
Spanish
Technical and Scientific Communication
Theatre
Women's and Gender Studies
World Literature

Dual Degree Programs

DaVinci Scholars Program
The DaVinci Scholars Program is a joint program between the College of Humanities and Social Sciences and the College of Design. Students completing the DaVinci Scholars program will earn two degrees within five or six years: a bachelor's degree in one of the five undergraduate disciplines in the College of Design and a B.A. or B.S. degree in the College of Humanities and Social Sciences. DaVinci Scholars will earn their first degree in design with no adjustment in their design requirements. They will elect a second major from any of those available in the College of Humanities and Social Sciences, including interdisciplinary studies. They must meet all requirements for both degrees.

The primary purpose of the dual degree program is to provide students with a strong liberal education as a complement to their professional degree study. In some cases, however, students will also improve their employment opportunities by selecting study that directly supports their profession in design. For example, students majoring in graphic design who take a second degree that focuses on writing improve their opportunities for employment in communications. A student in architecture with a second degree in history may improve opportunities for graduate study in architectural history, preservation, or urban planning. Study of foreign language may improve opportunities for international design practice.

Students who wish to participate in the DaVinci Scholars should apply to the Associate Dean of the College of Design at the beginning of their second semester of study in the College of Design. DaVinci Scholars will participate in special programs and meet as a group for regular discussions and advising. Interdisciplinary seminars led by College of Design and College of Humanities and Social Sciences faculty will focus on issues relevant to the nature of the disciplines. Other programs may include lectures and field trips. Scholarship funding is available for art-related summer study abroad.

Benjamin Franklin Scholars Program
A limited number of freshmen in the College of Engineering are selected to participate in the Benjamin Franklin Scholars program. Students completing the program receive a Bachelor of Science degree in an engineering discipline or computer science and a bachelor's degree in humanities or social sciences.

This dual degree program, a joint undertaking of the College of Engineering and the College of Humanities and Social Sciences, provides a unique opportunity to integrate a solid base of knowledge in technology or science with a broad humanistic and social perspective. The curriculum for the dual degree program has four main components: a strong general education, specially designed interdisciplinary courses, all technical course requirements associated with the engineering or computer science degree, and a second major in the humanities and social sciences chosen from among the traditional majors or an interdisciplinary major. Students who have matriculated in the College of Engineering and declared a major in the College of Humanities and Social Sciences and have at least a 3.0 GPA are generally eligible for scholarships from the program. With careful planning, this program can be completed in five years.

For more information, contact the Assistant Dean for Academic Affairs, College of Engineering, 118 Page Hall, or Dr. Joseph Herkert, Director, Science, Technology and Society Program and Franklin Scholars Program, 7218 D.H. Hill Library, or e-mail franklin-scholars@ncsu.edu.

Alexander Hamilton Scholars Program
The Alexander Hamilton Scholars Program permits students to earn a B.A. in International Studies and a B.S. in Accounting, a B.S. in Business Management, or a B.A. in Economics.

Key elements of the Alexander Hamilton Program include at least three semesters of foreign language study beyond the level required for admission to the university, a management capstone course (business policy and strategy or economics seminar) with a strong global orientation, and several additional courses on topics such as international relations, global affairs, and intercultural communication. Each Hamilton scholar is required to complete at least one international field experience.

Hamilton scholars will participate in special programs throughout their enrollment that are designed to increase their exposure to leading-edge management practices, international business, and foreign cultures. These programs will include activities such as special lectures and seminars, corporate tours and field trips, and scholar's banquets. For additional information about the Alexander Hamilton Scholars Program, contact the Associate Dean for Academic Affairs, College of Management, 112 Nelson Hall, or Dr. Anne Schiller, Director, CHASS International Programs, 125 Winston, (919) 515-9015.

Jefferson Scholars in Agriculture and the Humanities
The Thomas Jefferson Scholars Program in Agriculture and the Humanities is a joint program of the College of Agriculture and Life Sciences and the College of Humanities and Social Sciences. It is a program that leads participants to two degrees: on concentrating in an area of agriculture or life science and one in an area of humanities or social science. All majors in each college are available, to meet each student's particular interests and career goals. The purpose of the program is to produce potential leaders in agriculture and the life sciences who have not only technical expertise but also an appreciation for the social, political, and cultural issues that affect decision-making. The program includes special classes for Jefferson Scholars and a variety of social and services activities. Each spring a number of entering freshmen are chosen to participate in the Jefferson Program. Successful participants receive scholarship support after the sophomore year.

Rising freshman interested in applying to the Jefferson Scholars Program should contact either of the following people before January 15. An online application is available. Visit the Jefferson Scholars website for details at www.cals.ncsu.edu/student_orgs/jeffer.

Dr. Kenneth L. Ebenshade, Associate Dean, College of Agriculture and Life Sciences,
NCSU Box 7642, Raleigh, NC 27695, phone: (919) 515-2614

Dr. Laura Severin, Associate Dean, College of Humanities and Social Sciences,
NCSU Box 8101, Raleigh, NC 27695, phone: (919) 515-2568

Gifford Pinchot Scholars Program
The Gifford Pinchot Scholars Program, a joint program with the College of Natural Resources, follows the mode established by other dual degree programs. Academically talented students are invited to pursue simultaneously a B.S. degree in Forest Management through the College of Natural Resources and a B.A. degree in a major in Humanities and Social Sciences. The Pinchot Scholars Program is limited to a small number (10 or fewer per year) of highly qualified and motivated students. Scholarship support is available to some participants in the Pinchot Scholars Program.

Pinchot Scholars follow the requirements for the B.S. in Forest Management (with one exception: the physics sequence PY 211-212 is not required.) For the B.A. degree, they follow a 30-hour major concentration in interdisciplinary studies. Included in this major are two core requirements: IDS 498 Senior Thesis (3 credits) and an additional interdisciplinary studies seminar (1 credit). In addition, Pinchot Scholars complete all the general education requirements for a B.A. degree in the College of Humanities and Social Sciences. A total of 155 credit hours are required for the double degree, which students can complete in four and a half years.

The theme of the interdisciplinary studies major will involve placing forest management in the context of cross-cultural perspectives, global issues, and public policy. The exact set of courses that will constitute the major will be determined by students in consultation with their advisory group, subject to the approval of the Interdisciplinary Studies Committee. Each student is assigned an advisory group consisting of an academic adviser from each college, plus a mentor from the forest industry. Pinchot Scholars also participate in existing cooperative activities with other dual degree program scholars. For more information, contact the Associate Dean for Academic Affairs, College of Natural Resources, 1022-N Biltmore, Box 8001, or the Assistant Dean for Undergraduate Academic Affairs, College of Humanities and Social Sciences, 106 Caldwell, Box 8101.

Eli Whitney Dual Degree Program in Textiles and International Studies
This joint program between the College of Textiles and the College of Humanities and Social Sciences allows a student to earn a B.S. in Textile and Apparel Management and a B.A. in International Studies. This dual degree is designed to prepare students for work in the increasingly international textile industry. The program also includes possible overseas internships. Merit scholarship awards are available for high-achieving students who participate in the dual degree program in textiles and international studies. For more information, contact Dr. Nancy Cassill, Textile and Apparel, Technology and Management, 3313 Textiles Building, (919) 513-4180 or Dr. Anne Schiller, Director, CHASS International Programs, 125 Winston, (919) 515-9015.

Cooperative Education

Cooperative Education in humanities and social sciences seeks to broaden the student's intellectual horizons and at the same time to provide an introduction to the world of business, industry, government, or finance in preparation for a career after graduation. In this program, the freshman and senior years are usually spent on campus while the sophomore and junior years are devoted either to alternate periods of on-campus study and full-time work experience or part-time work and study on a continuous basis. The student is paid for work experiences by the employer. Ordinarily the program takes five years to complete, but those who are willing to attend summer school or take on a summer co-op assignment can finish in four years. Transfer students are eligible, and all interested students are urged to apply early in the academic year. The program is also open to graduate students although less time is required on work assignments.

Further information may be obtained from Cooperative Education, 300 Clark Hall, or at (919) 515-4425.

Honors Program

Each department in the college offers an honors program designed to encourage outstanding students to develop their intellectual potential to the fullest extent possible through individualized study, special seminars, and close association with faculty members in their major field.

Scholarships

In addition to the university-wide awards available, the College of Humanities and Social Sciences offers a number of merit and need-based scholarships. For further information contact Dr. Monica Leach, Assistant Dean for Academic Affairs and Director of Enrollment Management, College of Humanities and Social Sciences, (919) 515-2468.

Folger Institute

North Carolina State University is a member of the Folger Institute of Renaissance and Eighteenth-Century Studies, a unique collaborative enterprise sponsored by the Folger Shakespeare Library in Washington, D.C., and 20 universities in the Middle Atlantic region. Each year the institute offers an interdisciplinary program in the humanities— seminars, workshops, symposia, colloquia, and

lectures. Admission is open to faculty and students of North Carolina State University, and a limited number of fellowships are available through the campus Folger Institute Committee.

Evening Undergraduate Degree Programs

The College of Humanities and Social Sciences offers courses toward undergraduate degree programs during the evening hours for adult part-time students. Sufficient courses are generally offered in the evening hours to complete majors in English, history, political science, and sociology.

INTERDISCIPLINARY PROGRAMS AND DEGREES

Africana Studies Program

Core Faculty:
Dr. Craig C. Brookins, Associate Professor, Director
Dr. Deidre H. Crumbley, Associate Professor
Dr. Fred Hord, Professor (Director, African American Cultural Center)
Dr. John C. Charles, Assistant Professor, English
Dr. Lamont Welch, English

Bachelor of Arts in Africana Studies

The Africana Studies curriculum is designed to give students an integrated and critical understanding of the experiences, contributions, and achievements of peoples of African descent throughout the world. The core courses emphasize conceptual and methodological issues within Africana Studies. Students are taught academic skills and encouraged to conduct critical research and analyses designed to understand the relationships between and solutions to the political, social, cultural, and economic developments in Africa and the African Diaspora. The overall goal of the Africana Studies program is to provide students with competencies to succeed as citizens, workers, and leaders of the global community.

Minor in Africana Studies

The minor in Africana Studies provides a comparative and interdisciplinary study of the Black experience in Africa and the Americas. Three required courses include African Civilizations (AFS 240), an Introduction to African-American Studies (AFS 241), and Introduction to the African Diaspora (AFS 342). Two elective courses may be selected from a list of designated courses in such disciplines as anthropology, English, history, music, political science, psychology, sociology, and social work. Study Abroad (e.g., Africa, Caribbean) and service learning opportunities are also available.

Arts Studies Program

Core faculty:
Dr. Stephanie Spencer, Associate Professor, Director
Dr. Rodney A. Waschka, Professor

Bachelor of Arts in Arts Applications

The Arts Applications major offers four areas of specialization within a curriculum that focuses on the history, interpretation, and production of the visual and performing arts in aesthetic and cultural context. Students pursue the academic study of film, music, theater, or visual art. Within each specialization, they have opportunities to focus on the specific subject area and to develop connections between and among diverse art forms and practices, historical periods, and cultures.

Students take 21 hours in foundation courses (15 hours in history and analysis and 6 hours in production or studio courses), 6 hours in linking courses (courses that examine the relationship between art and other areas of inquiry in the humanities, social sciences, and sciences), a 3 hour capstone course, and an advised elective designed support their particular interests and career objectives. To enroll, students apply at the CHASS Dean's Office, 106 Caldwell.

Minor in Arts Studies

The Minor in Arts Studies is open to all undergraduate majors in the university. This interdisciplinary minor is designed to enrich the student's university experience, to serve as a foundation for learning and understanding the arts beyond the university years, and to stimulate intellectual development in ways that may reinforce or complement the objectives of the student's major. This minor provides the student with a fundamental understanding of the historical, theoretical, and practical disciplines of the arts.

A total of eighteen credit hours must be taken to complete this minor. Students interested in the minor should refer to the Arts Studies courses listed under "Arts Studies" in the course description section of this catalog. These courses are described in detail under their departmental prefixes.

Minor in Film Studies

Dr. Marsha Orgeron, Assistant Professor, Director

The Departments of English, Communication, and Foreign Languages and Literatures offer a Minor in Film Studies. The minor provides an introduction to the nature of the film experience, some background in the history of the medium, and the opportunity for in-depth study of selected topics. Fifteen hours of course work are required to complete the minor: ENG 282 and either COM 364 or COM 374, plus nine credit hours selected from the following: ENG 382, ENG 492, COM 244, COM 364 or 374 (whichever course was not taken to fulfill the requirement above), IDS 496, HI 336, and DN 316 (prerequisite waived, consent of instructor). Any students taking this minor cannot count courses from the minor toward their majors.

International Studies Program

Dr. Anne L. Schiller, Professor, Director

Bachelor of Arts in International Studies

The Bachelor of Arts in International Studies is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

Minor in International Studies

The International Studies Minor is offered to all students in the university who want to add a significant international dimension to their departmental majors. This minor program enables students to explore international topics, issues and research from cross-cultural, transnational perspectives. The program will provide some tools that students can use to understand better the global context of the modern world and to learn the international dimensions of their chosen fields of study.

Nonprofit Studies Program

Barbara Metelsky, Director

Minor in Nonprofit Studies

The interdisciplinary minor in Nonprofit Studies is designed to prepare undergraduate students for careers in the nonprofit sector, in both paid and volunteer positions. The program provides students with an understanding of the role of the nonprofit sector in society and builds students' knowledge, skills and abilities in effective nonprofit leadership. Through multiple service-learning experiences and a nonprofit internship requirement, students are offered a variety of hands-on experiences designed to facilitate an understanding of the issues and challenges faced by nonprofit organizations and prepare students for nonprofit leadership positions in the 21st century. The minor in Nonprofit Studies is a strong complementary course of study for students with majors offered across the NC State campus including Communication, English, History, Political Science, Psychology, Social Work, Parks, Recreation and Tourism, Forestry, Business Management, Art and Design, Education, and more. The minor in Nonprofit Studies enables students to explore the interconnections between their chosen field and the nonprofit sector.

Science, Technology, and Society Program

Core Faculty:
J. Herkert, Associate Professor, Director
P. Hamlett, Associate Professor

Science, Technology, and Society (STS) is an interdisciplinary field of study that seeks to explore and understand the many ways that science and technology shape culture, values, and institutions, and how such factors shape science and technology. We all depend heavily upon science and technology, and STS examines how science and technology emerge, how they enter society, how they change through social processes, and how society changes, as well. The objectives of the STS Program are to: Help its students learn some of the alternative ways of thinking and conducting research that characterize the interdisciplinary Science, Technology, & Society field, and to relate these to larger human concerns; Enable its students to explore complex STS topics by seeing them from multiple perspectives and in relation of other topics, and to integrate STS information and concepts from a variety of sources; Provide its students with the skills and resources to learn key STS concepts, literature, practices, and issues in order to encourage lifelong learning. For more information visit the STS Program website at www.chass.ncsu.edu/ids/sts.

Bachelor of Arts and Bachelor of Science in Science, Technology, and Society

The B.A. and B.S. majors in STS, include 30 credit hours of course work in the major: STS 214 - Introduction to STS; STS 403 - Seminar in STS; a four-course breadth requirement consisting of courses chosen from: I-History, II-Philosophy of Science and Ethics, III-Assessment and Policy, and IV-Other STS Courses; and a four-course STS Specialty that addresses a coherent theme related to science, technology, and society. To apply, students should contact the CHASS Dean's Office, 106 Caldwell, or e-mail the Program Director, joe_herkert@ncsu.edu.

Minor in Science, Technology, and Society

The Minor in Science, Technology, and Society is a fifteen-hour, interdisciplinary minor providing students an opportunity to appreciate and understand better the roles that science and technology play in the larger sociocultural context. A goal of the minor is to help students develop the ability to order and integrate the diverse aspects of their educations. Two essential components of this ability are sensitivity to the moral dimensions of scientific and technological inquiry as affecting how people may live or want to live and an appreciation of the practical implications of scientific and technical theory. In addition, the Minor in Science, Technology, and Society enables students to increase the breadth of their interests in science and technology.

Honors in Science, Technology, and Society

The Honors Program in STS offers an enriching and challenging educational experience to qualified majors. Admission to the program requires at least a 3.25 overall GPA and 3.25 major GPA, including STS 214 -Introduction to STS and at least 6 other hours of course work in the major requirements. Honors students must complete the Honors Option in STS 403 - Seminar in STS with a course grade of B+ or better; three hours of course work in the major requirements taken from among graduate courses and independent study courses; and three additional hours of course work in the major requirements taken from among honors courses, honors option courses, graduate courses, and independent study courses. Graduation requires a 3.25 GPA overall and a 3.40 GPA in the major. Successful completion of the program is noted on the student's transcript and in the commencement and honors convocation programs.

Bachelor of Arts and Bachelor of Science in the Interdisciplinary Self-Design Major

The Interdisciplinary Studies Self-Design major allows students to design their own academic majors. Instead of following the requirements for a major in one of the traditional disciplines, the candidate for the Bachelor of Arts or Bachelor of Science degree has the responsibility of organizing a concentration or field of specialization from two or more disciplines.

The freshman and sophomore basic requirements for the self-design major are the same as for the other Bachelor of Arts and Bachelor of Science programs in humanities and social sciences. In satisfying basic requirements in language, humanities, social science, mathematics, and natural science, students should, whenever possible, choose courses that are most appropriate as background for the courses in their major concentrations.

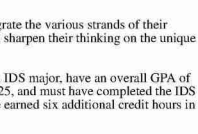
To become candidates for a self-design major in interdisciplinary studies, students must first get applications forms and information from the CHASS website and then prepare a tentative proposal, which includes a list of courses comprising 30 credit hours for the B.A. and 27 credit hours for the B.S. and an essay of 500 words explaining the reasons for making this set of courses the field of specialization. The student's proposal is reviewed by a faculty adviser or the director and submitted to the Self-Design Committee for consideration. After a thorough examination to determine whether the set of courses proposed as an interdisciplinary major is academically sound and coherent, the committee will approve the proposal or suggest specific improvements. To apply, contact Dr. Robert C. Kochersberger, Associate Professor, Director at rckeg@unity.ncsu.edu.

Honors Program

The Honors Program in Interdisciplinary Studies provides able students the opportunity to integrate the various strands of their concentrations in a capstone project. The program also provides a context in which students can sharpen their thinking on the unique challenges and opportunities of interdisciplinary work.

To be admitted into the IDS Honors Program, students must have earned nine credit hours in an IDS major, have an overall GPA of 3.25 and a major GPA of 3.25. To graduate with Honors in IDS, students must have a GPA of 3.25, and must have completed the IDS capstone course, "Independent Studies for IDS Students" with a grade of B+ or better, and have earned six additional credit hours in courses that are both Honors courses and also part of their IDS majors.

Women's and Gender Studies Program



Core Faculty:
Dr. Christine Pierce, Director
Dr. Karey Harwood, Assistant Professor
Dr. Mary Wyer, Assistant Professor

Bachelor of Arts in Women's and Gender Studies

The Women's and Gender Studies major provides students with a broad perspective on women's and gender issues from a wide variety of disciplines, leads students to critically examine and reinterpret existing data and common assumptions about gender and gender identity, familiarizes students with the often unacknowledged contributions made by women in various fields of endeavor, and encourages the translation of research into committed and responsible social involvement and leadership.

Minor in Women's and Gender Studies

The Women's and Gender Studies Minor offers all students in the university the possibility of rigorous interdisciplinary study of women's and gender issues. Course offerings across the campus give students the opportunity to understand the complex relationships between gender, class, ethnic, and race structures; to understand feminist theory and methodological perspectives and their substantial contributions to social and public policy analysis; to develop the ability to reach out to community and non-profit organizations concerned with social equality; and to develop international understandings and perspectives. For more information about the Women's and Gender Studies Program, please visit www.ncsu.edu/chass/wgs.

DEPARTMENT OF COMMUNICATION

Winston Hall, Room 201
phone: (919) 515-9736

K. Zagacki, Head
J. Jameson, Associate Head, Director of Undergraduate Program
W. J. Jordan, Associate Head, Director of Graduate Program
S. Stallings, Assistant Head for Advising

Professor: V.J. Gallagher, W.J. Jordan, R.L. Schrag, C.A. Smith, K. Zagacki; Professors Emeriti: L.R. Camp, W.G. Franklin, C.A. Parker; Associate Professors: K. Albada, D. Dannels, D.A. DeJoy, E.T. Funkhouser, J. Jameson, M. Johnson, R. Leonard, S. Stein; Associate Professor Emeritus: B.L. Russell; Assistant Professors: A. de Sourza e Silva, C. Farr, J. Ingram, W. Kinsella, J. Moore; Assistant Professor Emeritus: N.H. Snow; Special Faculty: J. Alchediak, B. Barnes, J. Hall, J. Heaton, C. Pullen, S. Stallings; Teaching Technician: R. Bell

The Bachelor of Arts in Communication program provides opportunities for study and training in human communication for professionals entering business, industry, non-profit organizations, or government service. Today, many organizations are seeking graduates with demonstrated competencies in human communication to fill positions that require constant and skillful contact with a wide variety of internal and external publics. Depending on their area of specialization, graduates may find employment opportunities as communication consultants, media specialists, trainers, public relations specialists, therapists, or performers. Many graduates choose to enter graduate or law school.

Programs of Study

The Communication major calls for the successful completion of at least 36 semester credit hours of Communication (COM) courses. All majors must take COM 230, COM 240, and COM 250 one-at-a-time, in sequence, and earn a "C-" or better in each course. In addition, all majors must take COM 110 and/or COM 112 (depending upon their concentration). Students select one of the five departmental concentrations in which they take the remaining credit hours in the major. The concentrations are:

Commmunication Media
This concentration focuses on the construction, distribution, use, and effects of visual images, sounds, and words conveyed through a wide range of communication media, including print, television, the Internet, and emerging technologies. Students create and produce media content, and also conduct empirical and critical analyses of issues related to media economics, history and development, social and global impact, and public policy.

Public and Interpersonal Communication
This concentration investigates analytical, theoretical, and skills approaches to the study of human communication processes and problems, including interpersonal relationships, group processes, conflict management, public and political discourse, argumentation, persuasion, and ethics.

Public Relations and Organizational Communication
This concentration focuses on the communication theories, methods, principles, and ethical practices used by organizations to establish and maintain mutually beneficial relationships with an organization's internal and external publics (such as employees, stockholders, and customers). Students are instructed in strategic planning and communication techniques used in a variety of organizations, including corporate, government, and non-profit entities.

Honors Program

The Honors Program in Communication provides academically talented students an opportunity to expand their curriculum and abilities through in-depth, guided study. Candidates for the program must have achieved junior standing with a TGPA of at least 3.25 and a minimum GPA in the major of 3.5 after completing the department's core curriculum and an additional six credit hours of Communication courses.

The honors program is compromised of nine credit hours. Three hours are devoted to the writing of a research paper, completed through either independent study or an honors option in a course taught by the student's research adviser. An additional three hours are dedicated to a "cognate course," chosen to enhance the student's background in the research topic and typically offered in a department outside of communication. The program culminates in the three hour Communication Honors Research Seminar, in which students discuss the various methods employed in their research projects and prepare their work for submission to a regional and/or national conference and for presentation to the Communication Department faculty.

Students seeking to enter the program first consider possible research topics, narrow the focus, and then discuss their ideas with different communication faculty. Once a faculty member agrees to become a student's honors adviser, the student adviser develops a plan that includes a prospectus of the research project, the mechanism for project completion (independent study or honors option in a course), and the selected cognate course. This plan is submitted to the director of the Honors Program and then reviewed by the departmental honors committee.

Students who complete an approved plan of study meeting the above requirements and graduate with a minimum TGPA or 3.25 and a GPA for Communication courses of at least 3.50 will have met the Honors program criteria successfully. Completion of the program will be noted on the student's transcript and diploma, and in the Commencement and Honors Convocation programs.

Curriculum Notes

- Students must enroll in COM 230 during their first semester as a Communication major.
- **Admission to the Department of Communication is based upon academic record.** Courses in progress at the time of the application deadline will not be considered. Two opportunities for admission exist: Automatic Admission and Admission by Application.
- **Automatic Admission:** Students will automatically be accepted into the Department of Communication if they have completed at least 12 hours at NC State with a GPA of 3.0 or better. Students who have met these criteria may enter the Department at any time in the year and should proceed to CHASS Dean's Office in Caldwell 106
- **Admission by Application:** Students not meeting the conditions for Automatic Admission may apply for entrance if they have completed 12 hours and have GPAs between 2.5 and 3.0 and have completed the following with a grade of "B-" or better: ST 311, FL 201, and PHI 221 or PHI 250 or LOG 201.

Application deadlines are February 15, June 15, and September 15.

Students who have met these criteria should proceed to the CHASS Dean's Office in Caldwell 106. Applications will be reviewed after each deadline; students will be notified of their admission status within one month of the deadline. **Please understand that admission is competitive and meeting these requirements does not guarantee admission.**

No final grades below "C-" are permitted for courses used to satisfy Departmental graduation requirements. No grades in COM courses below "C-" may be used to satisfy any University graduation requirements.

Minor in Theatre

The Department of Communication offers an academic minor in Theatre to all NC State undergraduate degree-seeking students except those majoring in Communication. The minor includes a combination of courses from traditional theatre and the communication theory curriculums.

Internships

The department operates an Internship Program that offers qualified seniors the opportunity to gain work experience in the communication field. The Internship is required of all students in the Public Relations Concentration, but students from the other Communication concentrations are also encouraged to participate in this program.

Graduate Programs

The Department of Communication offers a Masters Degree in Communication. In conjunction with the Department of English, the Department of Communication also offers an interdisciplinary Ph.D. program in Communication, Rhetoric, and Digital Media. For more information, please visit the Graduate School website at www.ncsu.edu/grad.

DEPARTMENT OF ENGLISH

Tompkins Hall, Rooms 221, 246
phone: (919) 515-3866

A. H. Harrison, Head
S. M. Setzer, Associate Head, Coordinator of Advising
B. M. Blackley, Assistant Head for Scheduling
C. Prioli, Director of Graduate Programs
A. M. Penrose, Director of First-Year Writing Program

William C. Friday Distinguished Professor: W.A. Wolfram; Alumni Distinguished Undergraduate Professors: A. Davis-Gardner, M.T. Hester, L.H. MacKethan, D.B. Wyrick; Professors: C. Anson, J. Balaban, M.P. Carter, J.A. Gomez, J.M. Grimwood, C. Gross, A.H. Harrison, M.T. Hester, H.D. Kellner, J.J. Kessel, T. Lisk, L.H. MacKethan, J. McCorkle, C.R. Miller, J. Nfah-Abbenje, M.E. Orr, A.M. Penrose, C.A. Prioli, L.R. Severin, A.F. Stein, J.F. Thompson, M.H. Thuente, J.N. Wall Jr., W. Wolfram, R.V. Young; Professors Emeriti: B.J. Baines, G.W. Barrax, P.E. Blank Jr., L.S. Champion, J.W. Clark, A. Davis-Gardner, J.D. Durant, M. Halperen, L.T. Holley, J. Ferster, H.G. Kincheloe, A.S. Knowles, B.G. Koonce, F.H. Moore, J.O. Pettis, J.J. Smoot, H.C. West, M.C. Williams, P. Williams, Jr.; Associate Professors: W. Barnhardt, B. Bennett, D.H. Covington, S. Dicks, N. Halpern, S.M. Katz, R.C. Kochersberger, L. May, S. Miller-Cochran, J.D. Morillo, M. Pramaggiore, S. Setzer, S. Smith-McKoy, E. Thomas,

C. Warren, D.B. Wyrick; Assistant Professors: A. Baker, B. Blackley, A. Bolonyai, J. Charles, M. Dudley, D.A. Hooker, J. Miller, D. Orgeron, M. Orgeron, J. Reaser, D.J. Reavis, D. Rieder, J. Swarts M.L. Welch; Senior Lecturer: P.R. Cockshutt

The Department of English offers basic and advanced courses in writing, language, and literature. The freshmen course required of all undergraduate students develops skill in expository writing and in analytical reading. Advanced courses in writing available to all students cover a variety of areas, including journalism, technical and business writing, and creative writing. These courses give students opportunities to pursue special personal and career interests, as do courses in literature, linguistics, film, and folklore.

The department offers a Bachelor of Arts major in English with six options: creative writing; film; language and literature; language, writing, and rhetoric; world literature; and teacher education. It also offers a Bachelor of Science major. Internships available to qualified students provide practical experience as well as an understanding of how academic studies are relevant to the workplace.

On the graduate level, the Department of English offers three graduate degrees: a Master of Arts in English, a Master of Science in Technical Communication, and a Master of Fine Arts in Creative Writing. In conjunction with the Department of Communication, the Department of English also offers an interdisciplinary Ph.D. program in Communication, Rhetoric, and Digital Media. For more information, please visit the Graduate School website at www.ncsu.edu/grad. A five-course certificate program in Professional Writing, available to students not seeking a degree at NC State, offers preparation in practical writing and editing, including both journalism and technical writing.

Opportunities

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine and for those intending to do graduate work in literature and rhetoric.

English Honors Program

The Honors Program in English provides courses that enrich the intellectual life of the English major. The Honors student contributes to and learns from seminar settings, takes up the obligation of independent study, produces documents representing sustained and logically articulated research practices, and earns recognition for excellent work beyond ordinary requirements.

For admission, students must have a minimum GPA of 3.25 and must have completed at least three English courses above the freshman level with a minimum GPA of 3.25. Successful completion of the Honors Program requires completion of 9 hours of honors courses with grades of A or B, a GPA of at least 3.25 in NC State English courses, and a minimum overall GPA of 3.25.

Bachelor of Arts in English

Major in English, Creative Writing Concentration
The student must schedule 36 hours beyond freshman composition. Within these hours, students must take eighteen hours of literature (including the CHASS six hours), six hours of linguistics, rhetoric or writing practice, and 12 hours of creative writing electives.

Major in English, Film Concentration
The concentration in film trains students in the history, analysis, and interpretation of film. Students schedule 36 hours in literature and film beyond freshman composition. Within these hours, students take fifteen hours of literature, six hours of linguistics, rhetoric, or writing practice, and fifteen hours of film studies. Through coursework in film studies, students acquire skills in interpretation, analysis, and criticism, situate films within historical periods, consider the relation of film to literary texts, and study important film genres, directors, and national traditions. They may also become involved in the creative work of screenwriting.

Major in English, Language and Literature Concentration
This curriculum provides a strong general education with an emphasis on the study of the English language and of British and American literature. It leads to a broad range of careers in education, business, government, law, etc. The major includes 36 hours of English courses beyond freshman composition, nine courses that satisfy categorical requirements and three elective English courses.

Major in English, Language, Writing, and Rhetoric Concentration
This curriculum provides a strong general education, a basic exposure to literature, and an emphasis on the study of written English in its theoretical, cultural, and practical applications. It can lead to a broad range of professions, with a special focus on careers that involve creating, designing and producing documents: the news media, business and technical communication, the writing and publishing professions. Students may also focus their studies upon rhetoric, composition, and linguistics and prepare for graduate study in these areas or for law school, teaching, and other professions. Students must schedule 36 hours of English courses beyond freshman composition, including 6 hours of CHASS literature electives, 15 hours from the English core, and 15 hours from a focused distribution of courses specially designed for LWR majors.

Major in English, Teacher Education Concentration
English majors may enroll in the Teacher Education Concentration offered by the College of Humanities and Social Sciences in cooperation with the College of Education. Students who complete this program are eligible to apply for certification to teach English in secondary schools in North Carolina. The requirements of this program include 25 semester hours in professional courses and 36 semester hours in English beyond freshman composition (total 125 credit hours required for graduation). Admission to the program requires the joint permission of the English department and the College of Education. Formal applications are required for Admission to Teacher Education Candidacy and Admission to the Professional Semester.

Major in English, World Literature Concentration
The Lawrence Rudner Concentration in World Literature provides a strong general education in the humanities while enabling students to study literature in a global context by mixing courses in English and American literature with courses in foreign-language literatures. It prepares for a broad range of post-graduate options, including graduate and professional school, and a wide variety of careers in business, education, government, and law. It is especially appropriate for students intending to pursue careers in international relations. Students must schedule 36 hours beyond freshman composition. The 36 hours include two courses in rhetoric, linguistics and writing practice; nine courses that meet categorical requirements in historical periods, cultural regions, and literary modes; and one elective course in literature. At least 18 of these hours must consist of ENG or ENG/FL courses; at least 12 of them must consist of FL or ENG/FL courses.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Bachelor of Science in English

The Bachelor of Science in English provides students with a broad but structured foundation in both the sciences and in language and literature. It requires 30 hours of English requirements, plus a 15-hour science/technology option.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in American Literature

The Department of English offers a minor in American Literature to NC State students, except for LAN and LIT English majors. The minor consists of any five courses in American literature, three of which must be at the 300 level or above, and one of which must be at the 400 level or above. Students may transfer in no more than six hours toward the minor. This minor will focus on the English language literature of the United States and of the British colonies out of which the United States emerged.

Minor in Creative Writing

A minor in Creative Writing is available from the Department of English for NC State students, except LCW English majors.

Minor in English

The Department of English offers a minor in English to majors in any field except English. The minor program will allow students to pursue general interests in writing, literature, and language.

Minor in Film Studies

The Departments of English, Communication, and Foreign Languages and Literatures offer a minor in Film Studies open to students across the university. The minor provides a comprehensive introduction to the art and industry of the cinema through courses in film analysis, history, theory, criticism, screen writing, and production.

Minor in Journalism

The Department of English and the Department of Communication offer a minor in Journalism to NC State students, except LWR English majors. The minor will provide course work in writing and editing news and features for print and non-media as well as an introduction to the profession of journalism.

Minor in Linguistics

The Department of English and the Department of Foreign Languages and Literatures offer a minor in Linguistics to NC State students, except LWR English majors. The minor is designed to investigate the structure and function of language as a cognitive and behavioral science. Five courses in designated areas of linguistics are required in the minor. Among students likely to be attracted to this minor are those who expect to pursue graduate study in linguistics, those interested in foreign languages or English as a second language, and those interested in communication sciences.

Minor in Technical and Scientific Communication

A minor in Technical and Scientific Communication is available from the Department of English for NC State students, except LWR majors, who are interested in supplementing their studies in technical, scientific, or other academic fields with strong writing and communication skills. Students minoring in Technical and Scientific Communication will be introduced to numerous genres including internal and external documents such as proposals, reports, science writing, users guides, reference manuals, and online documentation. Critical perspectives towards the role of communication in the creation of scientific and technical knowledge will be examined. The minor may lead to career opportunities in technical and scientific writing and communication.

Minor in World Literature

In keeping with the university's mission to provide an international curriculum, the World Literature minor offers NC State students, except for LAN and LIT English majors, an opportunity to broaden their perspectives on foreign cultures through the study of literature outside the Anglo-American tradition. Students will also develop critical, analytical, and linguistic skills essential in today's job market. The minor offers choices from a range of courses in literature, in translation or in the original language, from Europe, Asia, Africa, and Latin America.

DEPARTMENT OF FOREIGN LANGUAGES AND LITERATURES

310 Withers Hall
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R. V. Gross, Head
D. M. Marchi, Associate Head
S.G. Navey-Davis, Director of Undergraduate Advising
A.C. Wright, Scheduling Officer

Professors: T.P. Feeny, R.V. Gross, Y.B. Rollins, M.L. Sosower, M.A. Witt; Professors Emeriti: G.F. Gonzalez, J.R. Kelly; Associate Professors: V. Bilenkin, H.G. Braunbeck, G.A. Dawes, J.S. Despain, H.A. Jaimes, M.M. Magill, D.M. Marchi, J.P. Mertz, M.L. Salstad, E. Tai; Associate Professors Emeriti: S.T. Alonso, R.A. Alder, S.E. Simonsen.; Assistant Professors: M.A. Darhower, S.E. Garrigan, J. Mari, J. Michnowicz, E.L. Vilches, T. Wolford, A.E. Wright V. Wust; Special Faculty: D.F. Adler, T.P. Brody, A.B. Kennedy, S.G. Navey-Davis, H.S. Young

Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Bachelor of Arts in French or Spanish

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in French Language and Literatures, B.A. in Spanish Language and Literature, B.A. in French Language and Literature with Teacher Education option, and B.A. in Spanish Language and Literature with Teacher Education Option.

Outstanding students may become members of the Alpha Lambda chapter of Phi Sigma Iota, National Foreign Languages Honor Society or of the Sigma Delta Pi, National Hispanic Honor Society. A department honors program in French and Spanish is also available to eligible students.

Major in French or Spanish
Students must complete 36 hours beyond the 201 level [30 in French], including a senior seminar/capstone course. Majors must take 12 additional hours of advised electives [15 in French]. These are waived for students who choose to double major and for those who choose the Teacher Education Option.

Major in French or Spanish with Teacher Education Option
In collaboration with the College of Education and the Department of Curriculum and Instruction, the Department of Foreign Languages and Literatures offers a program leading to a French or Spanish teaching license in North Carolina, grades K-12.

The requirements of the program include 30 semester hours in professional education classes and 39 semester hours in Spanish beyond the 102 level [33 in French]. Candidates must consult with their academic adviser as early as possible for the proper planning of their curriculum. Application for admission to teacher education candidacy is made during the spring semester of the sophomore year.

Honors Program

The Honors Program in Foreign Languages and Literatures assists academically talented majors to realize their fullest potential as undergraduates in the field. To participate, students must have an overall GPA of 3.25 and a departmental GPA of 3.25 after 9 hours in the major. Successful completion of the program requires an overall GPA of 3.25, with 9 hours of Honors work, at least 6 of them in Foreign Languages and Literatures.

Programs Abroad

Summer study programs are offered in Austria, France, India, Italy, Mexico, Spain, and Peru.

Minors in Foreign Language, Literatures, and Cultures

Minor programs in the Department of Foreign Languages and Literatures include courses in language, literature, and civilization. The minor program requires 15 hours of study in Chinese, Classical Greek, Classical Studies, French, German, Italian, Japanese, Russian, or Spanish.

Undergraduate students majoring in any area of study at NC State are eligible to minor in a foreign language. Students may not, however, major and minor in the same language.

ESL at NC State

The English as a Second Language program serves the academic and professional language needs of international university students. Courses are designed to help both undergraduate and graduate students perfect their language skills. The English Placement Test may be required for new students. Check with the ESL section for details. An ESL licensure program is also available.

DEPARTMENT OF HISTORY

Withers Hall, Room 350
phone: (919) 515-2483

J. K. Ocko, Head
D. A. Zonderman, Associate Head
J. E. Crisp, Assistant Head
K. P. Vickery, Director of Undergraduate Advising
K.S. Vincent, Director of Graduate Programs
S.T. Parker, Director of the Honors Program
C.T. Friend, Director of the Public History Program

Alumni Distinguished Undergraduate Professors: W.C. Kimler, K.P. Vickery; Professors: J.R. Banker, D.P. Gilmartin, O.J. Kalinga, A.J. LaVopa, K.P. Luria, S. Middleton, J.K. Ocko, S.T. Parker, R.S. Sack, R.W. Slatta, E.D. Sylla, K.S. Vincent; Associate Professors: D.R. Ambaras, R.S. Bassett, H. Brewer, J.E. Crisp, A.F. Khater, W.A. Jackson, M.G. Kim, W.C. Kimler, N. Mitchell, S.L. Spencer, G. Surh, K.P. Vickery, D.A. Zonderman; Assistant Professors: M. Allen, M.M. Booker, B.M. Kelley, S. Lee, J. Mell, L. Minsky; Adjunct Assistant Professors: W. Atkins, J. Caddell, J.R. Lankford Jr.; Professors Emeriti: B.F. Beers, M.L. Brown, C.H. Carlton, A.J. DeGrand, M.S. Downs, R.W. Greenlaw, W.C. Harris, J.P. Hobbs, D.E. King, L.O. McMurry, G. O'Brien, B.W. Wishy; Emeriti Alumni Distinguished Undergraduate Professor: J.M. Riddle

The Department of History offers three undergraduate majors, a minor, an M.A. in History, and an M.A. in Public History (see *Graduate Catalog* for M.A. degrees). The departmental honors program provides a guided experience in independent research and awards departmental honors in history upon graduation. Outstanding history students are eligible for membership in Phi Alpha Theta, the professional honors society for historians.

The Department of History at NC State brings alive the treasure of human experience and cultures, from the ancient near East to the post-Cold War world, from Shang China to Mandela's Africa, from the Roman senate to the U.S. Senate. We are particularly strong in the history of race relations, law and society, the history of science and technology, and world history, and we have a strong record of publications, grant and fellowship awards, and public outreach.

History teaches that understanding a situation requires identifying with people who lived in other times and places. History is a discipline whose very method seeks and applies fair and appropriate norms to understand and judge human behavior. Students will learn to exercise independent judgment as well as to tolerate differences.

History melds personal experience with human experience and the wisdom of earlier ages. Through dialogue with the past, history deepens and enriches our appreciation of the present. History graduates will be better informed and more sophisticated about the world and their place in it than more specialist majors. Precisely because a history education provides general skills of information gathering, analysis, and communication, it is translatable into a variety of careers and professions in an information age economy. Our students can be expected to have the intellectual, social, and cultural flexibility need to cope with a rapidly changing work world.

Students may also pursue particular concentrations such as our clusters on such topics as the history of science and technology, and the history of law and society.

Opportunities

There are many reasons to major in History. History teaches us how to put forward the best argument based on the known facts. That is one reason it provides such an excellent preparation for the study of law. About 1/5 of our graduates go on to pursue teaching careers. But training in gathering all the relevant facts and developing the most persuasive explanation has application in business, government, journalism, and all the other professions.

Honors Program

The departmental honors program allows selected students to pursue intensive individually directed work in history. Students are invited to enter the honors program (usually in the junior year). Students must take 9 hours of individual, directed study (HI 498, 495, 496) leading toward the writing of an Honors Thesis. Students must also take an extra history seminar (HI 491) and participate for two semesters in a non credit honors reading seminar.

Majors in History

Bachelor of Arts in History (LAH)

Requires 30 hours of history course work (in addition to the 6 hours required of all College of Humanities & Social Sciences majors), including the HI 300 and HI 491 seminars. At least 24 of the 30 hours must be at the 400 level, and 9 of the 24 must come from three groups: pre-modern and non-western history (3); European history (3); and American history (3). This degree allows 33 hours of free electives for a total of 122 hours. History courses are scheduled in order to make possible the completion of the B.A. degree by evening attendance.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Bachelor of Arts, Teaching Option in History & Social Studies (LTH)

Students who complete this program are eligible for certification to teach social studies and history in secondary schools in North Carolina and most other states. Students are required to take professional courses in education and psychology and additional social science courses.

The degree requires 30 hours of history course work, including the HI 300 and HI 491 seminars, plus 12 additional hours of social science coursed from a prescribed list and 25 hours of professional courses in education and psychology. The degree is completed with 120 hours and includes no free electives. Contact Professor Ken Vickery, Gail O'Brien or Gerald Surh.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Bachelor of Science in History (LSH)

The importance of science and technology in our society makes a background in science and technology valuable even for humanities majors. The B.S. degree offers a way for students to get both the analytical and writing skills that come from a history major and the technical proficiency that comes with coursework in science and engineering. This combination is very helpful in a wide variety of careers, including law, business, and public policy. This degree is particularly well suited for students transferring into history from a science or engineering major.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

It requires 27 hours of history course work, including the 6 hours required of all College of Humanities & Social Science majors, the HI 491 seminar, and at least 4 other courses at the 400 level. HI 300 is highly recommended. This degree allows students to integrate a broad base in science and math, specialized study in a single area of science and technology, and a history education. This program includes 18 hours of free electives for a total of 122 hours. Contact Professor Ross Bassett.

Minor in History

The minor in history is flexible in that it can provide depth to a variety of majors by granting a larger historical understanding of a subject. Thus students majoring in political science but with a special interest in the Middle East or Europe can gain a much deeper understanding of how events in the past have shaped present dilemmas. Likewise, those wishing to attend law school can choose from a range of courses in legal history. You can tailor the minor to suit your individual interests. History courses teach not only background, but also methods of research, analysis, and writing. The minor requires 18 hours of history: two 200-level history courses, one in recent American or European history and one in ancient, medieval or renaissance history or in Asian, African, or Latin American history; and four courses at the 300 or 400 level (at least two of which must be at the 400 level).

DEPARTMENT OF PHILOSOPHY AND RELIGION

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M. J. Pendlebury, Head
J. C. Bivins, Associate Head
M. K. Cunningham, Coordinator of Advising, Senior Religious Studies Adviser
D. D. Auerbach, Senior Philosophy Adviser

Alumni Distinguished Undergraduate Professors: W.R. Carter, M.K. Cunningham, T.H. Regan; Professors: W. Adler, J.W. Carroll, G.L. Comstock, D.M. Jesseph, M.J. Pendleburg, C.M. Pierce, T.K. Stewart; Professors Emeriti: P.A. Bredenberg, R.S. Bryan, W.R. Carter, T.H. Regan, A.D. VanDeVeer; Associate Professors: D.F. Austin, J.C. Bivins, M.F. Bykova, M.K. Cunningham, R.P. Endicott, R.M. Hambourger, T.J. Hinton, B.B. Levenbook; Associate Professors Emeriti: W.C. Fitzgerald, W.L. Highfill, H.D. Levin, R.S. Metzger; Assistant Professors: D.D. Auerbach, A.B. Bigelow, M.F. Bykova, C.M. Driscoll, K.A. Harwood, R. Mabrito, K.M. McShane, D.N. Schmid

Philosophy and Religious Studies confront the most important questions with the most rigorous standards, relying on over two millennia of accumulated wisdom from the best minds. They provide excellent training for any line of work where there's value in the ability to think straight and express oneself clearly— virtually every line of work. Law school, medical school and other professional school admission boards know this. A double major in this department and another (e.g., political science for law, biochemistry for medicine) can make an applicant very attractive to a professional school. Majors receive excellent training for graduate school in Philosophy or Religious Studies, as is shown by the department's record in placing graduates in top graduate programs in each field.

Opportunities

For students interested in postgraduate study, information compiled by post-college professional schools reveals that undergraduate majors in philosophy and religion who apply to graduate schools of management have in the past scored extremely well in combined total scores on the Graduate Management Admission Test, with exceptional scores on verbal fields.

Those undergraduate philosophy majors who apply to law schools have been shown to be more likely to be admitted than virtually any other field represented. Students intending to study philosophy and religion in graduate programs have consistently scored much higher than other students on the verbal section of the Graduate Record Examination. Because of this capability of scoring so well on the various postgraduate tests, many businesses and industries welcome philosophy and religion majors into their training programs.

Philosophy Honors Program

The honors program in Philosophy offers an enriching and challenging educational experience to qualified majors. Admission to the program requires junior standing, completion of nine hours in the major, and a 3.25 GPA overall and in the major. Honors students must complete at least nine credit hours of option course work in Philosophy (including PHI 335 and PHI 498) and write an honors thesis (PHI 498) to be evaluated by the instructor for PHI 498 and one other member of the Philosophy faculty. Graduation requires a 3.25 GPA overall and in the major. Successful completion of the program is noted on the student's transcript and in the commencement and honors convocation programs.

Religious Studies Honor Program

The honors program in Religious Studies guides outstanding majors in independent, critical inquiry of the academic study of religion. Admission to the program requires junior standing, completion of nine hours in the major, and a 3.25 GPA overall and in the major. Honors students must complete at least nine credit hours of honors option course work in Religious Studies (including at least one 400 level course) and write an honors paper as part of an independent study course (REL 498) which is evaluated by an honors committee.

Graduation requires a 3.25 GPA overall and in the major. Successful completion of the program is noted on the student's transcript and in the commencement and honors convocation programs.

Bachelor of Arts in Religious Studies

Candidates for the Bachelor of Arts in Religious Studies must complete 33 credit hours in the major. The courses in religious studies must include one course in Western religious traditions (REL 317, 320, 323, 327); one course in non-Western religious traditions (REL 331, 332, 407, 408); one course in Biblical Studies (REL 202, 311, 312, 314; GRK 202); and a minimum of 9 hours of advanced studies (REL 402, 407, 408, 412, 413, 423, 471, 472, 481, 484, 491*, 496*, 498*). *Can be taken twice for credit.

Bachelor of Arts in Philosophy

Candidates for the Bachelor of Arts in Philosophy must complete 27 hours in philosophy, in addition to the three hours in philosophy required for all CHASS students. Included are two courses in the development of Western philosophic thought (two of: PHI 300, 301, or 302); a course in logic (one of LOG 201 or 335); one course in value theory (one of: PHI 221, 306, 309, 311, 313, 375, 415, 420, 422, or 450); one course in contemporary philosophy (one of: PHI 330, 331, 332, 333, or 440); one-credit writing courses in each of three core areas of philosophy (all of: PHI 494, 495, and 496); and four additional LOG or PHI courses.

Major in Philosophy with a Concentration in Philosophy of Law
The concentration requires 30 hours, in addition to the three hours of philosophy required of all CHASS students, including PHI 221 or PHI 375, two advised electives, three core courses (all of: PHI 309, 312, and 313), one course in development of Western philosophical thought (one of: PHI 300, 301, or 302), a course in logic or practical reasoning (one of LOG 201, 335, or PHI 250), one course in contemporary philosophy (one of: PHI 330, 331, 332, 333, or 440), and one credit writing courses in each of three central areas of philosophy (all of: PHI 494, 495, and 496).

Bachelor of Science in Philosophy

Candidates for the Bachelor of Science degree in Philosophy must complete 27 hours in philosophy, in addition to the three hours in philosophy required of all CHASS students. Included are two courses in the development of Western philosophic though (two of: PHI 300, 301, or 302); a course in logic (one of: LOG 201 or 335); one course in value theory (one of: PHI 221, 306, 309, 311, 313, 375, 415, 420, 422, or 450); one course in contemporary philosophy (one of: PHI 330, 331, 332, 333, or 440); one course in philosophy of science (one of: PHI 340 or 440); one-credit writing courses in each of three core areas of philosophy (all of: PHI 494, 495, and 496); and three additional LOG or PHI courses of the student's choice to meet the minimum 30 hours required.

Minor in Japan Studies

Students who take a Minor in Japan Studies are required to complete with a grade of C or better 18 hours of courses distributed as follows: Tested language competence through FLJ 202, with at least six hours of Japanese language instruction at NC State at or above the FLJ 201 level and four of the following cognate courses: EC 470; ENG/FL 394; HI 263; HI 264; HI 472; PS 342; REL 334. With the minor adviser's approval, additional Japan-related classes may be used to fulfill the cognate course requirement.

Minor in Cognitive Science

Students who take a Minor in Cognitive Science must complete 15 credit hours with a grade of C or better distributed as follows: Two of the three advanced core courses (two of: PHI/PSY 425, PSY 420, CSC 411), three additional complementary courses chosen from the following list for a total of 15 credits: CSC 312, CSC 333, CSC 411, ENG 210, ENG 324, ENG 524, ENG 525, ENG 527, LOG 335, PHI 331, PHI 332, PHI 425/PSY 425. PSY 340, PSY 400, PSY 420, PSY 430. Courses from at least three of the four primary disciplines of cognitive science must be represented in the minor. For purposes of the minor, the primary disciplines are philosophy (including logic), psychology, computer science, and linguistics.

Minor in Philosophy

Students who take a Minor in Philosophy are required to complete with a grade of C or better fifteen hours of courses in selected fields in philosophy, including a course in the history of philosophy (3 credit hours), a course in normative (ethics and ethics-related) philosophy (3 credit hours), a course other than one in normative philosophy, but not including logic or the history of philosophy (3 credit hours).

Minor in Health, Medicine, and Human Values

The Minor in Health, Medicine, and Human Values offers students an opportunity to assess critically a range of issues that are fundamental to the health of individuals as well as of society. From such an understanding, students as citizens will be more adequately prepared to meet these challenges in both private and public arenas.

Minor in Religious Studies

Students who take a Minor in Religious Studies are required to compete with a grade of C or better fifteen hours of courses in selected fields of religious studies. In order to ensure a wide study of the field, students are required to select at least one course in Western religious traditions and at least one course in non-Western religious traditions. REL 101 and REL 102 may not be counted in the minor.

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS

Caldwell Hall, Room 211
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R. C. Kearney, Director
A. J. Taylor, Chair of Political Science
E. O'Sullivan, Chair of Public Administration
H. Hobbs, Director, Master of International Studies
S. Carey, Director of Advising

Professors: C.K. Coe, D.M. Daley, G.D. Garson, M.S. Soroos, J.H. Svara, J.O. Williams; Professors Emeriti: W.J. Block, W. Holtzman, E.R. Rubin; Associate Professors: J. Greene, C. Griffin, S.H. Kessler, R.S. Moog, E. O'Sullivan, T.V. Reid, R.F. Stephen, J.E. Swiss, A.J. Taylor, M.L. Vasu; Associate Professors Emeriti: J.H. Gilbert, H.G. Kebschull, J.M. McClain; Assistant Professors: R. Bosworth, J. Brunet, R. Clerkin, M.D. Cobb, B. Nowell, M.J. Struett; Visiting Assistant Professors: H. Hobbs, J.R. Horner, S.K. Strauss; Special Faculty: S.M. Carey, P.M. Pavlik

The Department of Political Science, part of the new School for Public and International Affairs, offers basic and advanced courses in all major fields of the discipline: American government and politics (local, state, and national), public law and criminal justice, public administration, comparative politics, international relations and global issues, political theory, and methodology of political science. The department affords opportunities for the study of government and administration to students in other curricula and schools.

Graduate courses in public administration and international studies are available to advanced undergraduates. See the listing of graduate degree programs and consult the *Graduate Catalog*.

The department provides academic credit for internships with political parties and campaigns, lobbyists, non-profits, and all levels of government, including the North Carolina General Assembly Legislative Internship Program. Majors in political science with distinguished academic achievements are annually invited to join the Zeta Epsilon Chapter of Pi Sigma Alpha, the national political science honor society.

Opportunities

A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

Honors Program

The honors program includes nine credit hours of specialized coursework designed to challenge academically talented majors and allow them to realize their greatest potential as political science students. Required for admission to the program: 3.25 GPA both overall and in the major, completion of 9 hours of PS coursework, and completion of PS 371. Majors admitted to the program complete a substantial research project in consultation with a faculty honors adviser (6 credit hours). Also required: either one 500 level PS course or an honors option 400 level political science course (3 credit hours). Successful completion of the program is noted on the student's transcript, and at commencement.

Curricula

Bachelor of Arts in Political Science

Major requirements are: 19 hours of core courses that cover major political science sub fields (i.e., American government, international relations, theory, public law and policy, and research methods) as well as courses that develop computer competencies and an orientation to the discipline; 15 hours of political science electives, 12 of which must be taken at the 300 level or above, and one of which must be a 400 level senior seminar, which includes a substantial research requirement. Grades of C- or better are required for courses applied towards the major. At graduation, a minimum GPA of 2.0 is required for all political science courses taken. For a semester-by-semester guide to the course requirements for the Bachelor of Arts curriculum, including all of the concentrations described below, see the departmental website at www2.chass.ncsu.edu/pspa.

Students who wish to focus their studies in a specific sub field may elect one of the following concentrations under the Bachelor of Arts program:

American Politics
This concentration develops skills that benefit students interested in graduate and professional school, administrative careers, and business careers that involve government relations and policy. Major requirements are: 21 hours of core courses; 9 hours of courses specifically related to the study of political processes, institutions, political culture, and political events within the American system.

International Politics
This concentration develops skills that benefit students interested in graduate or professional school, careers in government service, inter national organizations, issue advocacy, and businesses with international interests. Major requirements are: 15 hours of core courses; 12 hours of concentration electives in regional and world politics; 3 hours of concentration electives in any political science sub field.

Law and Justice
This concentration develops skills that benefit students interested in graduate or professional school (particularly law school), law enforcement, judicial administration, and careers with agencies involved in the administration of justice. Major requirements are: 18 hours of core courses; 12 hours of emphasis electives in either the justice system or law and theory.

Public Policy
This concentration prepares students for careers with public institutions where they will work with the processes, formulation, implementation, and evaluation of public policy at international, national, state, and local levels. Major requirements are: 15 hours of core courses; 15 hours of concentration electives.

Bachelor of Science in Political Science

Major requirements are 27 hours of political science coursework. At least 6 hours must be taken from each of the following groups: Group A-American politics/or public policy and administration; Group B- international affairs/comparative politics; and Group C-political theory/scientific methods. At least 18 hours of coursework must be at the 300 level or higher. At least 6 hours of coursework must be at the 400 or 500 level, including one course that is designated as a senior seminar. Grades of C- or better for courses applied towards the major with a minimum GPA of 2.0 for all political science requirements for the Bachelor of Science curriculum, see the departmental website at www2.chass.ncsu.edu/pspa.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Political Science

Minor requirements are 15 hours of political science coursework with grades of C- or better in each course and a cumulative GPA of 2.0 for all political science courses. A minimum of 12 hours must be taken at the 300 level or above, including one 400 level senior seminar. Coursework must cover at least two of the following three groups: Group A- American politics/or public policy and administration; Group B- international affairs/comparative politics; and Group C- political theory/scientific methods.

Minor in Law and Justice

Minor requirements are 15 hours of political science coursework with grades of C- or better in each course and a cumulative GPA of 2.0 for all political science courses. These 15 hours must include: PS 205 (Law and Justice); 12 hours of elective courses, at least one of which must be a 400 level seminar or a 500 level graduate course in political science. This minor program is designed for students who have a special interest in the areas of public law, criminal justice and political theory.

DEPARTMENT OF PSYCHOLOGY

Poe Hall, Room 640
phone: (919) 515-2251
website: www.ncsu.edu/psychology

D. Gillan, Head
D. H. Mershon, Associate Head
S. A. Lane, Assistant Head, Undergraduate Coordinator

Alumni Distinguished Undergraduate Professors: K.W. Klein, D.H. Mershon; Professor Emeritus: T.E. LeVere; Professors: L.E. Baker-Ward, D.W. Drewes, W.P. Erchul, D.O. Gray, A.G. Halberstadt, T.M. Hess, J.W. Kalat, R.W. Nacoste, D.W. Martin, D.H. Mershon, J.J. Michael, A.C. Shulte, F.J. Smith, M.S. Wogalter; Associate Professors: C.C. Brookins, S.A. Lane, M.E. Haskett, K.W. Klein, R. Mitchell, S.B. Pond, M.A. Wilson; Clinical Assistant Professor: P.W. Collins; Assistant Professors: S.B. Craig, P. Martin, C.B. Mayhorn, L. Thompson; Associate Members of the Faculty: C.D. Korte (Interdisciplinary Studies), R.G. Pearson (Industrial Engineering), J.L. Wasik (Statistics); Adjunct Professors: A.D. Hall, J.L. Howard, W. Tornow, L.G. Tornatsky; Adjunct Associate Professors: B.H. Beith, B.A. Braddy-Burrus, B.F. Corder; Adjunct Assistant Professors: J.W. Fleenor, C.L. Kronberg, C.E. Lorenz, S.N. Palmer, B.H. Rogers; Professors Emeriti: J.C. Johnson, H.G. Miller, S. Newman, P.W. Thayer; Associate Professors Emeriti: J.L. Cole, R.F. Rawls

Psychology is one of the basic majors in liberal arts and sciences. Psychologists use the methodology of science to study human behavior and experience. A bachelor's degree in psychology forms an excellent foundation for careers in business and government, as well as enhancing life skills such as parenting and human social interaction. Students can also use this degree as an entry into further education leading to an advanced degree in applied or experimental psychology, or to such fields as law, medicine, business or social work. There are two programs for undergraduate majors in psychology: The General Option (PSY) and Human Resources Development (HRD). Each emphasizes different aspects of psychology. Separate descriptions of these programs are included in the next section.

Curriculum in Psychology - General Option

The General Option is oriented toward the student who wants a broad understanding of the types of problems with which psychology is concerned and the ways in which psychologists approach and attempt to solve these problems. Curriculum requirements in the General Option are sufficiently flexible for students to concentrate, if they wish, in another area of study as well as psychology, and thereby prepare themselves for a variety of careers or professional programs. By wise choice of elective courses, a student can prepare for medical, legal, business, or education graduate training, while at the same time acquire a basic background in the social sciences.

Human Resource Development

The Human Resource Development (HRD) Option is designed to provide a groundwork of skills and experience for students who wish to enter human service careers with a B.A. degree. With appropriate curriculum modifications, the program can also provide a sound background for students who wish to go into advanced degree programs in psychology, management, personnel, social work. counseling, guidance, education, and other areas. Students interested in graduate school should confer with their advisers in order to plan an appropriate course of study.

The HRD Option focuses on enabling students to gain direct experience in the areas in which they would like to work. HRD students devote a semester to learning principles and skills related to working with human problems, and subsequently each HRD student spends a semester working part-time or full-time in a job related to his/her own area of interest. The HRD Option accepts a maximum of 20 students each year. Interested students already in the general option can apply for admissions to HRD during the fall semester of their sophomore or junior year. Further information about the HRD option is available through the Department of Psychology office.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Honors Programs

Honors tracks reside within the General Option and the Human Resource Option. The goals of the programs are to provide a curriculum that will expose the most talented majors to a more rigorous set of courses both within and outside of psychology than is required of standard undergraduate tracks and to provide them some pre-graduate school experiences. In addition, the program provides Honors students a close working relationship with individual faculty in research and data collection. By these means, Honors students develop transcript records attractive to graduate schools and are formally recognized for their superior achievement. To be eligible for admission, students must complete a minimum of 45 semester hours of course work (at least 15 at NC State) and have a grade point average of 3.25 or better. Additional details as to admission and requirements are available from the Department of Psychology.

All undergraduate majors are members of the Psychology Club, which provides a number of enrichment activities, including sponsorship of the Carolinas Psychology Conference. One of the largest undergraduate conferences in the United States, it is held annually in cooperation with Meredith College and other Cooperating Raleigh Colleges. There is also an active chapter of Psi Chi, the national psychology honor society, which provides enrichment to the program.

Minor in Psychology

The Department of Psychology offers a minor in psychology to majors in any field except psychology. To complete the minor, eighteen hours of courses are required, six of these hours in the basic science of psychology, and nine in the applied aspects of psychology. PSY 200 is a required prerequisite. All must be passed with a grade of "C" or better. To be eligible for the psychology minor, students must have passed PSY 200 with a grade of "B-" or better and must have passed BIO 105/106 with a grade of "C" or better. The student must also have an overall GPA of 3.0.

Minor in Cognitive Science

The Departments of Psychology and Philosophy and Religion offer an interdisciplinary minor in cognitive science. The minor provides a general introduction to contemporary interdisciplinary research within the framework of the "computer model" mind, and offers the student the opportunity for in-depth study of selected topics of such as the nature of human information processing, and the acquisition and use of machine intelligence.

To complete the minor, 15 hours are required, distributed as follows: PSY 420 (Cognitive Processes); PSY 340 (Ergonomics) or PSY 744 (Human Information Processing); PHI 331 (Philosophy of Language); PHI 332 (Philosophy of Psychology); PHI/PSY 425/525 (Introduction to Cognitive Science).

DEPARTMENT OF SOCIAL WORK

2806 Hillsborough Street
phone: (919) 515-2492

J. Pennell, Head
C. E. Waites, Associate Head
L. Williams, Director of Field Education
T. Hancock, Program Director
C.E. Waites, Graduate Program Director

Professor: J. Pennell; Associate Professors: C.E. Waites (Graduate Program Director), T. Hancock (BSW Program Director); Clinical Associate Professors: L.R. Williams, J. Wells; Assistant Professor: N. Ames, W. Casstevens, M. Leach, J. Taliaferro; BSW Advising Coordinator: N. Outlaw

The Department of Social Work offers the Bachelor of Social Work (B.S.W.) degree, which is fully accredited by the Council on Social Work Education. Students complete a curriculum based on the liberal arts that incorporates a professional foundation, including social work practice, human behavior and diversity, community social services, social policy, and research methods. Optional courses offer opportunities to study in depth various social work practice areas such as child welfare, aging, health care, addictions recovery, African American families, and school social work. Students will complete preprofessional placements and a 480-hour field placement in a social service setting. A minor in Social Work is available.

The purpose of the Department of Social Work is to prepare students for entry-level professional practice in social work or for advanced graduate-level academic work. The curriculum is a liberal arts base that includes English, literature, history, natural science, math and statistics, foreign language, philosophy, social sciences, physical education, and free electives. Forty-nine hours of core social work courses and 3 hours of social work electives complete the 121 hour graduation requirement. Enrollment in practice and field classes is limited to social work majors, and no credit towards the social work degree is given for student life experiences.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

Social work is an exciting, challenging, and dynamic profession. No matter what the political climate or the changing nature of personal or social need, social workers will be in demand. Social workers are employed in a variety of settings which include health care, mental health, services to the aging, child welfare, public welfare, addictions recovery, public schools, developmental disabilities, and many other public and private settings. In each of these areas there is recognition for professional preparation, and the B.S.W. graduate will be prepared to embark upon a career in his or her chosen field. All states, including North Carolina, have licensing or certification procedures for social work practice. Graduation from the Department of Social Work makes the student eligible for such licensing or certification.

Minor in Social Work

The minor is designed to familiarize students with the social service system, major social welfare programs, and elements of the profession of social work. The student takes four required courses and selects one additional course from elective offerings, which represent the contribution of professional social work in a number of settings.

Student Organizations

Baccalaureate Student Social Work Association (BSSWA) is open to all social work majors and provides an opportunity for students to socialize and become involved in the professional community outside the school through a wide variety of campus and community activities and aids in maintaining a sense of unity and purpose among the students.

Phi Alpha Honor Society is national honor society for social work students. A B.S.W. student is eligible for membership after achieving national and local chapter requirements which include having sophomore status, achieving a 3.0 overall grade point average and a 3.25 grade point average in required social work courses, and completing 9 hours of social work courses.

Matriculation into the Professional Degree Program

The social work faculty is committed to helping all entering students evaluate career goals and objectives to ensure that the students meet minimum academic standards; have goals and objectives compatible with the major; and know specifically what the profession of social work is in terms of its philosophy, value base, and fields of practice. The matriculation procedure is intended to strengthen the student's certainty regarding career choice and to enhance the student's focus and sense of purpose in curriculum planning. Specific components of the matriculation procedure include: (1) applicant must be a current social work major; (2) completion with a grade of B- or better in two of the following courses: SW 201, 290, 310, and/or 312; (3) participation in an orientation session; (4) completion of the application to matriculate; and (5) may be asked to have a personal interview with the Department Student Review Committee. The Department of Social Work Student Handbook spells out further details of this procedure, as well as other elements of the department.

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

Harrelson Hall, Room 161
phone: (919) 515-3180

E. L. Kick, Head
S. C. Lilley, Associate Head and Department Extension Leader
D. A. Curran, Undergraduate Administrator
T.N. Greenstein, Director of Graduate Programs
S.C. Lilley, Department Extension Leader

Sociology Teaching, Research and Extension Faculty: Goodnight-Glaxo Wellcome Endowed Professor: C.R. Tittle; William Neal Reynolds Professor: R.C. Wimberley; Alumni Distinguished Graduate Professor: M.D. Schulman; Alumni Distinguished Undergraduate Professor: V.M. Aldige; Alumni Distinguished Undergraduate Professor: L.R. Della Fave; Professors: W.B. Clifford, T.J. Hoban, E. L. Kick, J.C. Leiter, P.L. McCall, R.L. Moxley, E.M. Woodrum, M.A. Zahn; Associate Professors: M.P. Atkinson, R.F. Czaja, S.M. DeCoster, R.L. Engen, T.N. Greenstein, S.C. Lilley, M.L. Schwalbe, W.R. Smith, M.E. Thomas, M.S. Thompson, R.J. Thomson, K.M. Troost; Assistant Professors: F. Chen, M. Crowley, S. McDonald; Professors Emeriti: E.M. Crawford, T.N. Hobgood Jr., R.D. Mustian, L.B. Otto, M.M. Sawhney, M.E. Voland; Associate Professors Emeriti: R.C. Brisson, A.C. Davis, S.K. Garber, P.P. Thompson; Assistant Professors Emeriti: C.G. Dawson; Associate Member of the Faculty: J.R. Thigpen (Sea Grant); Adjunct Professor: A. Thompson (North Carolina A&T State University); Adjunct Associate Professor: C.R. Zimmer (UNC-Chapel Hill). **Anthropology Teaching and Research Faculty:** Alumni Distinguished Undergraduate Professor: A.L. Schiller; Associate Professors: J.M. Wallace; Assistant Professors: D.T. Case, R.S. Ellovich, S.M. Fitzpatrick, J.K. Jacka, A.H. Ross; Associate Professors Emeriti: G.S. Nickerson, I. Rovner, M.L. Walek

The Department of Sociology and Anthropology offers introductory and advanced courses in sociology and anthropology covering the major subfields of the two disciplines. It also offers supervised fieldwork and practical experiences required for certain curricula in the department.

Aims of the departmental offerings are to provide majors with academic background and experience useful for many careers in government and industry or for pursuing advanced academic work (for a description of the graduate degrees offered by the department, see the *Graduate Catalog*) and to provide service courses to other students.

The department, jointly administered by the Colleges of Humanities and Social Sciences and Agriculture and Life Sciences, offers seven undergraduate curricula. The five curricula administered by the College of Humanities and Social Sciences are Bachelor of Arts in Sociology, Bachelor of Arts in Criminology, Bachelor of Arts in General Anthropology, Bachelor of Arts in Applied Anthropology, and Bachelor of Arts in Bioarchaeology.

Honors Program

In this program, outstanding majors pursue an individual program of study involving close working relations with departmental faculty. Twelve credit hours of honors courses will allow students to enhance their expertise in sociology and anthropology. Honors courses combine nine hours of credit in regular and independent study classes with a three-credit honors thesis done in consultation with a faculty honors adviser.

To be admitted, students must have earned 12 hours in their major and have a 3.25 overall GPA and a 3.25 in the major. To graduate with Sociology/Anthropology Honors, the student must have a 3.25 GPA overall and in the major. Successful completion of the program is noted on the student's transcript diploma and at commencement.

Bachelor of Arts in Sociology

Sociology studies the behavior and interaction of people as they operate in society. The groups that people form such as families, peers, ethnic groups, and social classes are investigated. The following departmental requirements must be met by all students majoring in sociology: A minimum of 31 hours in the major field including SOC 202, SOC 300; theory, SOC 400 or 401; no more than three additional credit hours of 200-level sociology courses; and, at least 12 credit hours of 400 level or above sociology courses. Additional electives in sociology may be at the 300 level or above. ST 311 is also required.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Bachelor of Arts in Anthropology

The major introduces students to anthropology with basic and advanced offerings in the subdisciplines of the field. The comparative nature of anthropology is reflected by courses based in a variety of geographical areas. Theory and methods courses are required. An internship is required for the applied concentration. Specific curriculum requirements are available online: www.ncsu.edu/curricula.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Bachelor of Arts in Criminology

The Criminology degree seeks to develop a professional orientation that will be relevant both to occupational goals and participation as a citizen in community affairs. Courses provide a general background in the causes of crime and the agencies of criminal justice. More specific areas covered deal with deviance, juvenile delinquency, the court system, correctional facilities, and the like, including field placement in an agency of the criminal justice system.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Anthropology

A minor in Anthropology focuses on the comparative study of human beings, with emphasis on biology and behavior. A flexible selection of courses (15 credit hours) includes offerings from anthropological subdisciplines such as cultural anthropology, physical anthropology, archaeology, and linguistics.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Criminology

The criminology minor emphasizes criminological theory and research. The minor is grounded in sociological theory and methods and allows students flexibility in the choice of specialized criminological study such as juvenile delinquency, sociology of law, formal institutions of social control, community and crime, and data analysis in criminology, ideology and social justice.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Sociology

This minor emphasizes sociological theory and research with substantive applications. The minor builds on theory and methodology and allows students flexibility in the choice of sub-specialties such as stratification, race and ethnic relations, agriculture, development, work and organization, or the family.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

COLLEGE OF MANAGEMENT

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e-mail: management@ncsu.edu
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Ira R. Weiss, Dean
K. Shannon Davis, Associate Dean, Undergraduate Programs
Steve Allen, Associate Dean, Graduate Programs and Research

College of Management

Advances in science and medicine, technology and engineering are continually changing how we live, learn, work, and play. The College of Management's curriculum provides students the knowledge and skills needed to launch careers in our dynamic global business community. Graduates will be prepared to seek positions with large corporations, small firms and startups, non-profit organizations, government agencies, or to start their own businesses. They also may pursue advanced studies in law, professional accounting, economics and business administration.

The college's academic departments provide a wide range of options that enable students to build on their personal interests and strengths, or to explore new directions. Students may study accounting, information technology, financial management, supply chain management, marketing, sales, economic analysis, human resource management, management information systems or entrepreneurship. Communication skills and computer literacy are integrated in the business curriculum, along with project-based, hands-on learning that provides valuable real-world experience.

Students also gain a strong liberal arts background through electives and special areas of concentration that they may choose from the many options available through NC State's historically strong academic programs in science, technology, engineering, humanities and social science. Dual degree and cross-disciplinary programs are also available, and students are encouraged to participate in study abroad, internships, and co-op programs.

The College of Management is accredited by AACSB International--the Association to Advance Collegiate Schools of Business. Accreditation brings the college into the select ranks of the best business and management schools in the world.

More than two dozen of the college's faculty are members of NC State's Academy of Outstanding Teachers, and many others have been honored for their teaching, research and service. Six research groups or teaching initiatives provide opportunities for focused study and applied learning in entrepreneurship, innovation management, supply chain management, and other areas. The faculty is organized in four departments: accounting, business management, economics, and management, innovation and entrepreneurship.

Degree Programs

The college offers four undergraduate degree programs: B.S. in Accounting, B.S. in Business Management, and a B.A. and B.S. in Economics. Accounting and business management are professional degree programs.

The B.S. in Accounting degree provides a broad business education and a specialization in accounting issues and skills. Students develop interpersonal, teamwork and problem-solving skills, and learn how to apply technology in the accounting field. The curriculum includes financial and managerial accounting, taxation, business law and ethics, auditing and accounting information systems. Three concentrations are offered: financial analysis, information systems, and managerial accounting.

Outstanding students completing the Bachelor of Accounting program may choose to apply directly into the Master of Accounting program, earning the graduate degree with just one additional year of coursework. Successful completion of the graduate program qualifies them to sit for the Certified Public Accounting exam.

The business management curriculum focuses on core business functions and offers five different concentrations: finance, human resource management, information systems/information technology, marketing, and operations and supply chain management. All students learn about finance, marketing, strategy, law, operations, human resources and information systems. The curriculum emphasizes computer skills and the application of information technology, teamwork, problem-solving and critical thinking for decision making.

The economics program provides a broad education in the liberal arts with a specialization in economic theory and application. Students can choose the Bachelor of Arts in Economics Degree, which includes more liberal arts courses, or the Bachelor of Science in Economics, which includes a greater focus on mathematics, statistics, and science courses. The program is flexible, and students can easily pursue an economics degree and either a minor or even a double major in another area with careful planning.

New freshmen will enter the college as undeclared majors. In their third semester, students will choose which degree program they want to pursue. Transfer students will enter directly into their chosen degree program.

For those interested in advanced studies, the college also offers graduate degrees: Master of Accounting, Master of Economics, Master of Business Administration and Doctorate in Economics.

Admission to the College of Management

To learn more about admission requirements and how to apply to the College of Management, visit mgt.ncsu.edu/undergraduate/future_students/.

Alexander Hamilton Scholars Program

The Alexander Hamilton Scholars Program is a dual degree program sponsored jointly by the College of Management and the College of Humanities and Social Sciences at NC State. Students earn a degree in accounting business management or economics. This specialized program focuses on a specific region of the world and one of its major languages. Students may choose from several global regions.

Hamilton Scholars participate in special programs designed to increase their exposure to leading-edge management practices, international business, and foreign cultures. These include attendance at lectures and seminars, and participation in corporate tours and field trips, and scholars' banquets.

Requirements for this program include advanced study in a foreign language, a management capstone course (a business policy and strategy course or economics seminar) with a strong global orientation, and several additional courses on topics such as international relations, global affairs, and intercultural communication. Each Hamilton Scholar is required to complete at least one international experience lasting a minimum of six weeks.

For more information, contact the Undergraduate Programs Office in the College of Management, 2100B Nelson Hall.

Academic Minors

Students enrolled in other majors at NC State may choose to minor in accounting, business management, economics, or entrepreneurship. See department section for details.

Student Life

Several student organizations provide opportunities for undergraduate students to gain valuable leadership and business experience and to participate in service and recreational activities. These include the honor societies Beta Gamma Sigma for accounting and business management majors and Omicron Delta Epsilon for economics majors, as well as the following student organizations: Accounting Society, Alpha Kappa Psi (professional business fraternity), Student Ambassadors, American Advertising Federation, Economics Society, Entrepreneurs Club, Business Ethics Society, Institute of Management Accountants, National Association of Black Accountants, Peer Leaders, Pre-Law Student Association, Society of African-American Corporate Leaders, Society for Human Resource Management, and Society for Politics, Economics and Law.

Facilities

Nelson Hall, home of the College of Management, has 12 classrooms, the nearly 400-seat Nelson Auditorium, and the Ericsson Video Classroom, as well as six computer labs, two of which are used for teaching. All classrooms are equipped with contemporary instructional technology and are upgraded regularly. Nelson Hall is wired for remote access.

Student Services

The College of Management provides comprehensive academic advising services to undergraduate students. Faculty Mentors as well as Professional advisers, located in Office of Undergraduate programs, are available to meet with students. The college also has career services staff dedicated to working with our students as they launch their job searches.

Scholarships

In addition to university-wide awards, the college has several scholarships for College of Management majors, primarily for entering freshmen. The college reviews all freshmen applicants for admission who may be eligible for scholarships. Upperclassmen are encouraged to contact their academic department, as well as the University Financial Aid office for more information on availability of scholarships.

DEPARTMENT OF ACCOUNTING

3102 Nelson Hall
phone: (919) 515-2256

F. A. Buckless, Department Head

The accounting program provides education and training to individuals who will pursue careers as professional accountants in business, government, and industry. The Department of Accounting offers Bachelor of Science and Master of Accounting degrees. The Bachelor of Science degree requires the student to specialize in one of three concentrations: Information Systems, Financial Analysis or Managerial Accounting. The Master of Accounting (MAC) degree program was developed in response to employment markets for more highly skilled accounting professionals and responds to the American Institute of Certified Public Accountants' mandated 150-hour education requirement for certification.

The Bachelor of Science degree in Accounting consists of a broad foundation in humanities, social science, science and mathematics; a comprehensive business core; a comprehensive accounting core; and a concentration in a functional accounting area. Students develop strong communication and team skills. Many courses prepare students to use information technology to solve accounting and business problems.

Opportunities

Accounting systems and the accountants who maintain them are absolutely essential to the functioning of business enterprises of all types and sizes, to government at all levels; and to nonprofit organizations. Many career opportunities are available to accounting graduates. Starting salaries are among the highest of all university graduates, and potential earnings over a lifetime are excellent.

The accounting profession is organized into three major employment groups:

- approximately 60 percent of accountants are employed in business entities;
- another 10 percent work in non-business entities
- about 30 percent are in public practice.

Public accountants offer auditing, tax preparation, and planning and management consulting to individuals, businesses, and other organizations on a fee basis. Management or industrial accountants design financial and cost accounting systems and provide their companies with financial management, financial analysis, planning and budgeting, product costing, and operational auditing. Governmental units and other not-for-profit entities have informational needs similar to private businesses. Accountants employed by such entities perform many of the same functions. Accountants in some governmental agencies, such as the Securities and Exchange Commission, Internal Revenue Service, and Federal Bureau of Investigation, serve the dual function of auditing and law enforcement. Certified public accountants (CPAs), certified management accountants (CMAs), certified internal auditors (CIAs), and certified cost analysts (CCAs) are individuals who, like doctors, dentists, and lawyers, are licensed to practice their profession. Such certifications are granted to those accountants who pass a qualifying examination and meet certain accounting experience and educational requirements.

Curriculum and Degree Requirements

All Accounting majors are subject to the department's residence requirement of 30 credit hours of course work after being formally admitted to the B.S. degree program in Accounting (or the B.S. in Business Management). In addition, Accounting majors must complete at least 30 hours of major courses and at least six of the following courses in residency at NC State: ACC 310, 311, 330, 410, 450, and the ACC concentration course (ACC 411, 420, or 440). A "General Policies" statement for all College of Management majors is available in the Undergraduate Programs Office, 2100B Nelson Hall. It serves as an addendum to the curriculum requirements and describes GPA requirements for graduation, residency requirements, suspension policy, required grades in specific courses, course repeat policy, etc.

Minor

The accounting minor is offered to students interested in gaining a basic knowledge of accounting and an understanding of how accounting information is used to make rational decisions by individuals, businesses, and society. The minor requires 15 hours of accounting courses, which includes ACC 200, ACC 210, ACC 330, and 6 hours in 300- or 400-level ACC courses. It provides familiarization with financial accounting, managerial accounting, and income taxation; an understanding that accounting as an information system for measuring, processing, and communicating financial information about economic entities; and an understanding of how accounting information allows users to make reasoned choices among alternative uses of scarce resources in the conduct of business and economic activities.

For additional information, view the curriculum and courses information on the College of Management's website at www.mgt.ncsu.edu/undergraduate/current.

DEPARTMENT OF BUSINESS MANAGEMENT

2300 Nelson Hall
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D. Baumer, Department Head

DEPARTMENT OF MANAGEMENT, INNOVATION AND ENTREPRENEURSHIP

1300 Nelson Hall
phone: (919) 515-5590

S. Barr, Department Head

Faculty from the departments of business management and management, innovation and entrepreneurship teach students pursuing the Bachelor of Science degree in business management. This degree program prepares students for careers in business, government, or nonprofit organizations and for graduate study in business, law, and related fields. The curriculum offers a broad professional education with a specialization in a business field such as finance, human resources, marketing, management information systems, and operations/supply chain management.

The curriculum consists of a broad foundation of humanities, social science, sciences, and mathematics; comprehensive business courses; and a concentration in a functional business area. The program emphasizes management in a highly competitive global economy. Students learn to work in teams and develop strong communication skills and learn to work in teams. Many courses prepare students to use information technology and computers to solve real business problems. Required courses in the major include topics such as accounting, business strategy, communications, economics, finance, information technology, legal environment of business, marketing, operations management, organizational behavior, and quantitative methods. Business management students also complete a four-course business concentration

Opportunities

Graduates of this degree program are prepared for a variety of careers in business or industry, including banking and finance, manufacturing, product development, human resources, IT management, and business analysis. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Curriculum and Degree Requirements

All Business Management majors are subject to a departmental residency requirement that they complete a minimum of 30 credit hours of course work at NC State after being formally admitted to the B.S. degree program in Business Management (or the B.S. in Accounting). In addition, Business Management majors must complete at least 30 credit hours of the major course requirements of the degree while in residency at NC State. A General Policies statement for all College of Management majors is available in the college's Undergraduate Programs Office, 2100B Nelson Hall. It serves as an addendum to the curriculum requirements and describes GPA requirements for graduation, residency requirements, suspension policy, required grades in specific courses, course repeat policy, etc.

Graduation Requirements for Honors in Business Management
Completion of 12 credit hours of honors course work and achievement of at least a 3.25 overall GPA and at least a 3.25 GPA in all honors courses completed.

Minor in Business Management

The Department of Business Management offers a minor in Business Management to undergraduates other than those majoring in the B.S. degree in Accounting (ACC). Students majoring in Textile and Apparel Management (TXM) or Agricultural Business Management (ABM) must meet the standard course requirements for the Business Management Minor including at least three courses (9 credit hours) that are not required courses for their major (or part of a list of alternative courses that meet a major requirement). Students must apply for admission to the business management minor program. Visit the College of Management website for details and print an application.

Enrollment in upper level business management courses is limited.

Minor in Entrepreneurship

The minor in entrepreneurship is open to all undergraduate majors outside the department of Business Management and Accounting. The minor in entrepreneurship helps students become entrepreneurial thinkers and provides them with an understanding of management principles applied in the unique environment faced by the founders of new business ventures. Students will be well grounded in the business planning process and in the process of launching a new venture. Many of the skills and principles that students master also apply to management teams launching new ventures from within existing companies. Experiential learning and interaction with the entrepreneurial business community are important elements of the courses in the minor.

For additional information, view the curriculum and courses information on the College of Management's website www.mgt.ncsu.edu/undergraduate/current.

DEPARTMENT OF ECONOMICS

4102 Nelson Hall
phone: (919) 515-3274

D. K. Pearce, Department Head

The Department of Economics offers Bachelor of Arts and Bachelor of Science degrees in Economics. An undergraduate program in economics prepares a student for careers in business and government as well as for graduate and professional schools.

Economics students can develop their understanding of economic issues in a variety of areas, including financial institutions, international trade and finance, labor and industrial relations, health care economics, industrial organization, environmental and natural resource economics, public finance, and economic history. An economics degree is attractive to employers because it provides a rigorous analytical training with a broad understanding of the workings of the economic system. Its flexibility also allows students to tailor their education to specific interests and career goals. An undergraduate degree in economics has long served as the foundation for advanced professional degrees in business and law, as well as for graduate study in economics.

Curricula

The Bachelor of Arts in economics is a broad and flexible program of study. The major course work for the Bachelor of Arts in economics includes 9 semester hours of economic theory and 10 hours of mathematics and statistics. In addition, students study at least 18 semester hours of advanced, applied economics. The program provides for substantial flexibility so that students, in consultation with their faculty advisers, may tailor their studies to their particular interests and long-term objectives.

The Bachelor of Science in economics puts particular emphasis on training in analytical methods in economics. It differs from the Bachelor of Arts by having less emphasis on the liberal arts and greater emphasis on courses in mathematics, science, and statistics.

A "General Policies" statement for all College of Management majors is available at the college's Undergraduate Programs Office, 2100B Nelson Hall. It serves as an addendum to the curriculum requirements and describes GPA requirements for graduation, residency requirements, suspension policy, required grades in specific courses, course repeat policy, etc.

Honors Program

The Honors Program in Economics is designed for academically talented and motivated students who desire a richer educational experience than offered in regular courses. The primary goal of this program is to help students develop the ability to apply economic analysis to a variety of issues of involving choice at the individual, household, firm, and government level. Class size is kept small in honors sections to accommodate discussion and interaction among classmates as well as the instructor. Students graduating with honors in economics are well prepared for graduate or professional school as well as for entering the private or public sector job market.

COM Honors Admission to Honor Courses

You may enroll in economics honors courses if you are part of the University Scholars program or if you have completed 30 hours at NC State with an overall GPA of 3.25 or better.

Graduation Requirements for Honors in Economics

To be certified on the diploma as a graduate of the department's honors program, you must have at least a 3.25 GPA in all economics courses attempted at NC State and an overall GPA of 3.25 or higher. In addition, you must take the Honors Seminar (EC 490H) and at least two courses from the following list: EC 301H, EC 302H, a Faculty Initiated Honors Option EC course, or a 500 level EC course.

If you have questions about the honors program, contact Dr. Michael McElroy.

Minor in Economics

Open to all undergraduate majors outside the Department of Economics, the minor in economics is designed to give students a basic understanding of economic analysis, to involve them in applied work in one or more fields of economics, and to introduce them to the application of economics to contemporary social issues. The minor in economics is an excellent complement to many majors within the university, including political science, statistics, business, accounting, and engineering. To complete the minor in economics, students must take EC 205 (or EC 201), EC 301, EC 302, and two additional economics courses at the 300 level or higher for total of 15 semester hours. Please contact the Undergraduate Programs Office in 2100B Nelson Hall for specific information about admission and other requirements.

For additional information, view the curriculum and courses information on the College of Management's website mgt.ncsu.edu/undergraduate/current/course_pages_undergrad.php

COLLEGE OF NATURAL RESOURCES

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NCSU Box 8001
Raleigh, NC 27695-8001
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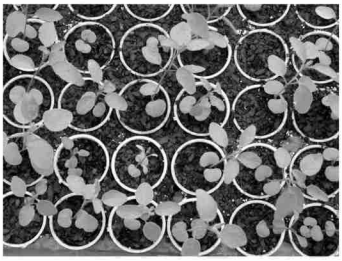


The mission of the College of Natural Resources is to improve the use and stewardship of renewable natural resources. We seek to strengthen natural resource management, enhance environmental quality, increase productivity of forest enterprises, expand recreation and tourism opportunities, and encourage sound regional economic development. To these ends, we provide superior professional education, discover new knowledge, and disseminate credible and timely information.

The success of our students is our top priority and is accomplished through an unwavering commitment to excellence from all individuals involved in the educational enterprise. The College of Natural Resources is a place where the physical, biological and social sciences intersect. The interaction of disciplines, all of which are dependent upon the natural resources base, makes the College of Natural Resources a dynamic, diverse, and exciting place to study and to work. Our goal is to provide educational programs, facilities, and services for a population of students, faculty, and staff that reflect the diversity in culture of our state, our country, and our world. In our college diversity is characterized in many ways, such as the geographic origin, age, gender, ethnic background, the career paths of our students, and the professional disciplines of our faculty. Faculty, staff, administrators, and students come from the northern, southern, eastern, and western parts of the United States and from many nations including: Australia, Canada, the Czech Republic, China, Egypt, India, Iran, the Philippines, and others.

The College of Natural Resources offers students professional and technical curricula that emphasize finding solutions to real world problems. Our college consists of students and professionals dedicated to the highest achievement in science-based global forest stewardship, research and development of forest products that raise the standard of living for all people, and recreation that enriches societies and cultures through responsible enjoyment of our natural resources. Although interrelated, the three academic departments— Forestry and Environmental Resources; Parks, Recreation and Tourism Management; and Wood and Paper Science— draw faculty and students with very different career aspirations. The common thread is the sustainable and wise use of the world's natural resources.

Students within the College of Natural Resources find an intellectually challenging environment, and an educational community that is conducive to learning. With the increasing diversity and size of the college's population, our goal of raising the standard of living for all people becomes a realistic and inspiring goal.

Degree Programs

The College of Natural Resources offers programs of study leading to baccalaureate and graduate degrees in the management and use of natural resources, and also offers courses in these areas to students in other colleges. Ten professional curricula are administered in the college through its Departments of Forestry and Environmental Resources; Parks, Recreation and Tourism Management; and Wood and Paper Science. These programs provide a broad education in the biological, physical, and social sciences as well as a sound cultural and professional background. Baccalaureate degrees prepare students for careers in the fields of fisheries and wildlife management; forest management; natural resources assessment and management; environmental monitoring and testing; parks, recreation and tourism management; professional golf management; sport management; paper science and engineering; environmental science-watershed hydrology; and wood products.

Graduate degrees offered include Master of Science, Master of Forestry, Master of Natural Resources Administration, Master of Wood and Paper Science, Masters of Parks, Recreation and Tourism Management, and the Doctor of Philosophy. Graduate degree programs may be tailored to a variety of specialized and interdisciplinary topics related to the teaching and research activities of the college. In addition, a graduate certificate in Graphical Information Systems is available to NC State students who wish to develop recognized academic credentials in the GIS area. Applicants should consult the *Graduate Catalog* for additional information about these programs.

Student Activities

Each department in the college has a student curriculum club and/or student chapter of the appropriate national professional organization. All of these organizations provide opportunities for professional development, for interaction with faculty and other students, and for participation in local, regional, and national student and professional activities. Student representatives from each organization and curriculum serve on the College of Natural Resources Council. The Council provides overall coordination for student activities, allocates funds for student activities, and oversees production of the Pinetum, the College of Natural Resources student yearbook.

CNR Ambassadors

The CNR Ambassador Program highlights the "student face" of the college. The group is composed of leaders from each program in the college, following a college-wide nomination and selection process. Their activities include representing the college in many ways, ranging from mentoring freshmen to working with prospective students, through shadowing experiences, phone calls and

campus tours. In addition the Ambassadors represent their programs and the college to outside visitors, such as the Board of Trustees, Foundation officers, and others who would like to know about the CNR student experience at NC State.

Facilities and Laboratories

In addition to standard classrooms and teaching laboratories, the College of Natural Resources has a unique complex of indoor and field facilities that are utilized in the academic programs. Computer facilities include a general computer lab, two labs with computers and workstations for disciplinary applications such as geographic information systems and remote sensing, a high-tech "collabratory" designed especially for student team project work, and access to the university computer network. Also available are several different analytical and biotechnology facilities, a photo interpretation lab, an extensive herbarium, and a wood sample collection. About 95,000 acres of forestland are available for field instruction and research at Chowan Swamp, Bull Neck Swamp, Goodwin Forest, Hill Forest, Hofmann Forest, Hope Valley Forest, Hosley Forest and Schenck Forest. Slocum Camp, the site of the annual forestry and wildlife camps at Hill Forest, contains classrooms, dining facilities, and student and staff housing. Specialized pilot plant laboratories unique to wood and paper science are contained in the Hodges Wood Products Laboratory and the Reuben B. Robertson Pulp and Paper Laboratory. Equipment in the Hodges Laboratory includes computer controlled woodworking machinery, dry kilns, veneer lathe and numerous other items required to convert wood into products. The Robertson Laboratory is a 50,000 sq. ft. facility, which contains laboratories and modern pulping and paper making equipment dedicated to teaching and research activities. Examples of equipment are secondary fiber recycling equipment, a thermo-mechanical pulping unit, a pilot-scale paper machine, process control equipment, paper testing laboratory, and pulping digesters.

Fields of Instruction and Work Experience

All curricula in the college have strong components of hands-on field and laboratory instruction and experience, and all either require or strongly recommend on-the-job work experience. All students are required to complete the equivalent of one or more of the following summer activities: camp, internship, practicum, and work experience. The Forest Management and Fisheries and Wildlife curricula both have required summer camps. Undergraduates enrolled in Parks, Recreation and Tourism Management complete a 9-week internship immediately following the completion of the junior year. All Paper Science majors complete a 12 week internship in an industrial setting approved by the college. Wood Products students attend a summer practicum following the freshman year and are required to complete a summer internship in the industry. Students in all curricula may also participate in summer jobs and the cooperative education program to gain work experience.

Outdoor and other practical laboratories are a regular part of some courses. In other courses, field instruction may include longer trips (often on weekends) to privately owned businesses and industries, governmental agencies, state and federal forests, and wildlife refuges.

Honors and Scholars Programs

The College of Natural Resources participates in the University Honors Program, the University Scholars Program, and the Women in Science and Engineering (WISE) Program in which exceptional new students (freshman or transfer) are selected for special courses and activities that provide an expanded educational experience.

The College of Natural Resources also offers a disciplinary honors program, which offers the opportunity for advanced students with outstanding records to enhance the depth of study in their major field. Students with an overall GPA of 3.0 or better and a major GPA of 3.25 or better are invited to participate in the Honor's Program. Students must have at least 40 hours of credit. Honors students develop more rigorous programs of study, frequently taking advanced courses in mathematics, science, or social science, or graduate courses in the chosen curriculum. With the adviser's consent honors students may substitute preferred courses for normally required courses in order to develop strength in special interest areas. Honors students are required to undertake a program of independent study, which can involve a research problem or special project during their junior or senior year, and they must participate in the senior honors seminar.

Two honor societies in the College of Natural Resources promote and recognize academic excellence: Xi Sigma Pi (for majors within the Forestry and Wood & Paper Science) and Rho Phi Lambda (for recreation majors). Advanced undergraduate and graduate students with high academic achievement are invited to become members of these societies. High achieving forest management and natural resources students are also eligible for recognition by two agriculture honor societies, Alpha Zeta and Gamma Sigma Delta. All students are also eligible for recognition by the campus-wide honor societies.

Gifford Pinchot Scholars Program

The Gifford Pinchot Scholars Program, a joint program with the College of Humanities and Social Sciences, follows the model established by the Jefferson, Franklin, and Whitney Programs. Academically talented students may pursue simultaneously a B.S. degree in Forest Management through the College of Natural Resources and a B.A. degree through the College of Humanities and Social Sciences. The Pinchot Scholars Program is limited to a small number (10 or fewer per year) of highly qualified and motivated students. Scholarship support is available to some participants in the Pinchot Scholars Program.

Pinchot Scholars follow the requirements for the B.S. in Forest Management (with one exception: the physics sequence PY 211-212 is not required). For the B.A. degree, they follow a 30-hour major concentration in interdisciplinary studies. Included in this major are two core requirements: IDS 340 Perspectives in Agricultural History (3 credits) and IDS 498 Senior Thesis (3 credits). Participants also complete an additional IDS seminar (1 credit). In addition, Pinchot Scholars complete all the general education requirements for a B.A. degree in the College of Humanities and Social Sciences. A total of 155 credit hours are required for the double degree, which students can complete in four and a half years.

College of Natural Resources

This interdisciplinary studies major places forest management in the context of cross-cultural perspectives, global issues, and public policy. The exact set of courses that will constitute the major will be determined by the student in consultation with their advisory group, subject to the approval of the Interdisciplinary Studies Committee. Each student is assigned an advisory group consisting of an academic adviser from each college, plus a mentor from the forest industry. Pinchot Scholars also participate in existing cooperative activities with other double-degree program scholars. For more information, contact the Associate Dean for Academic Affairs, College of Natural Resources, 1022-N Biltmore, Box 8001 or the Assistant Dean for Undergraduate Academic Affairs, College of Humanities and Social Sciences, 106 Caldwell, Box 8101.

Scholarships

The College of Natural Resources administers a large program of academic scholarships that is separate from the University Merit Awards Program. About 170 academic scholarships (ranging from $1,000 to $10,000 per year), renewable annually, are awarded in several program areas to entering freshmen and transfer students. The appropriate departments accept applications, and based on academic excellence and leadership award the scholarships administered through the North Carolina Forestry Foundation and the Pulp and Paper Foundation.

Computer Competency

Extensive use of computers and workstations is incorporated throughout all curricula of the College of Natural Resources. Students are expected to use the computer for increasingly complex class assignments and for the preparation of papers and reports. Computing resources are available for student use in the college and elsewhere on campus, but many students find it more convenient to purchase a personal computer. Questions about such purchases should be directed to the Associate Dean for Academic Affairs or the appropriate departmental curriculum coordinator.

International Activities

Students in the College of Natural Resources are exposed to the international dimensions of their programs in a variety of ways. Many faculty members regularly travel abroad and a number are active in major projects in foreign countries, including an international cooperative research project concentrating on Central American and Mexico and a faculty exchange program with Sweden. With that faculty experience, the international aspects of many topics are covered in core courses, and several elective undergraduate and graduate courses focus specifically on the international dimensions of natural resource management. In addition, many international students enroll in the college with as many as 21 different countries represented in recent years. There are also in-the-major study abroad opportunities, which are led by CNR faculty, and which range from two-week trips to five-week summer sessions. There is also scholarship support to help students take advantage of international job opportunities.

DEPARTMENT OF FORESTRY AND ENVIRONMENTAL RESOURCES

Jordan Hall, Room 3119
phone: (919) 515-2891

B. Goldfarb, Head
J. P. Roise, Director of Undergraduate Programs
R. C. Abt, Director of Graduate Programs

Distinguished University Professor: E.B. Cowling; Alumni Distinguished Undergraduate Professors: G.B. Blank, R.B. Braham, R.A. Lancia; Carl Alwin Schenck Professor: H.L. Allen; Edwin F. Conger Distinguished Professor: R.R. Sederoff; Professors: R.C. Abt, H.L. Allen, R.B. Braham, R.I. Bruck, V.L.C. Chiang, E.B. Cowling, F.W. Cubbage, P.D. Doerr, W.S. Dvorak, E.C. Franklin, D.J. Frederick, B. Goldfarb, J.D. Gregory, A.E. Hassan, J.B. Jett, S. Khorram, R.A. Lancia, R. Lea, S.E. McKeand, J.P. Roise, R.R. Sederoff; Research Professor: V.P. Aneja; Professors Emeriti: A.W. Cooper, C.B. Davey, R.C. Kellison, B.J. Zobel; Associate Professors: H.V. Amerson, R.E. Bardon, G.B. Blank, M. Buford, B. Bullock, H.M. Cheshire, L.J. Frampton, G.R. Hess, G.R. Hodge, E.M. Jones, L. Li, C.E. Moorman, D.J. Robison, T.H. Shear, E.O. Sills, T.A. Steelman, A.M. Stomp, S.T. Warren, R.W. Whetten; Associate Professor Emeriti: L.G. Jervis, R.J. Weir; Assistant Professors: J. Collazo, B.L. Conkling, C. DePerno, D.W. Hazel, F. Isik, J. King, S.E. Moore, S.A.C. Nelson, E.G. Nichols, L.M. VanZyl; Research Associate Professor: S. Pattanayak; Research Assistant Professors: J. Phelan, G. Catts, J. Coulston, R.H. Schaberg, Lecturers: J.L. Cox, T.H. Litzenberger, L. Taylor; Associate Members of the Faculty: P.T. Bromley, W.J. Fleming, L.F. Grand (Plant Pathology), R.A. Powell, T.R. Simons (Zoology), H.A. Devine, L. Gustke, R. Moore, B.E. Wilson (Parks, Recreation and Tourism Management), F.B. Hain (Entomology), L.E. Hinsley (Horticultural Science), Susan McNulty (USDA), E.A. Wheeler (Wood and Paper Science)

The undergraduate program of the Department of Forestry and Environmental Resources prepares students for professional challenges, personal growth, and a lifetime of service as managers of renewable natural resources. The curricula endeavor to produce well-educated forestry and natural resources graduates who have the basic knowledge, skills, flexibility, and attitude needed for successful professional performance in a wide variety of career opportunities. Graduates will be prepared to face the challenges of competing uses of natural resources and the environment, and the pressures for increasing production of goods and services from natural ecosystems while maintaining their quality for future generations.

The Department of Forestry and Environmental Resources strives to enroll and graduate a high-quality culturally and racially diverse student body to enhance the diversity and richness of forestry and natural resources professionals. Its academic curricula are enriched by out-of-class contacts among students, faculty, and practicing professionals, which promote a sense of professionalism and professional community. Gaining practical experience is encouraged through participation in summer employment, internships, and the cooperative education program.

The department has six Bachelor of Science programs: Forest Management, Natural Resources Ecosystem Assessment, Natural Resources-Policy and Administration, Fisheries and Wildlife Sciences, Environmental Sciences-Watershed Hydrology, and Environmental Technology. The Forest Management curriculum provides the broad-based forestry education needed for direct employment into positions in a wide variety of forestry or forestry-related organizations. The Natural Resources curricula provide more generalized, interdisciplinary programs in natural resources management that focus on the area indicated in the curriculum titles. The Fisheries and Wildlife Sciences curriculum provides specialization in biological sciences and management needed by non-profits, governmental agencies, and industries. The curriculum in Environmental Sciences Watershed Hydrology focuses on the specialized area of hydrologic science and watershed management. The Environmental Technology curriculum provides broad-based and applied skills for the assessment and management of society's impact on the environment.

Instruction and practice in communications skills (both writing and speaking) are integrated into the required forestry (FOR) courses throughout the Forest Management curriculum and to a lesser extent in natural resources (NR) courses of the Natural Resources curriculum, and in several of the professional courses of the Environmental Sciences Watershed Hydrology, Environmental Technology, and Fisheries & Wildlife Sciences curricula. The communications-across-the-curriculum program produces graduates who are highly competent and confident in the communication skills needed by successful natural resource managers and environmental sciences professionals.

The use of computers is integrated into all of the curricula in the department. Practical assignments on the use of computers as a tool in natural resource management are integrated into many of the advanced courses. The curriculum in Environmental Sciences Watershed Hydrology, in particular, has a very heavy emphasis on computer applications (including programming) throughout the general math and science courses as well as the advanced professional courses.

Information on department programs may be obtained by contacting Ms. Vonda Easterling, College of Natural Resources Recruiting Coordinator, NCSU, Box 8001, Raleigh, NC 27695-8001, phone (919) 515-5510 or Dr. Joseph P. Roise, Director of Undergraduate Programs, Department of Forestry and Environmental Resources, NCSU, Box 8008, Raleigh NC, 27695-8008, phone (919) 515-7783, e-mail: joe_roise@ncsu.edu.

Scholarships

The Department of Forestry and Environmental Resources annually awards four types of scholarships that are available to freshmen, transfers, and advanced students: Academic, Forestry & Wildlife Summer Camp, Industrial and Work-Study. About 40 Academic Scholarships varying between $4000 and $7000 are awarded annually in May for the following academic year and are renewable provided that superior progress is made toward a degree. Timber sales from the James L. Goodwin and Hofmann forests and nineteen endowments provide these awards: T. Clyde and Sally Watts Auman, Bartlett Tree Service, William J. Barton and Alexander Calder, Jr., John M. and Sally Blalock Beard, Class of 1960, Fenton P. Coley, Edwin F. Conger, Crescent Resources/Duke Power, Robert E. Dorward, Hare/Hofmann/Huff, J.P Harper/T.G Harris/Chesapeake Corporation, Sam Hughes, G. Jackson, Philip Jackson, Larry and Elsie Jervis, R.B. and Irene Jordan, Leonard Kilian/National Association of State Foresters, William R. Poole, Thomas Quay, Donald and Jean Steensen, Jonathan Wainhouse, and Camp Younts.

Eight scholarships support students attending forestry or wildlife summer camps. Each award provides $500-$1000. Six endowments support these awards: Ralph C. Bryant, Carteret County Wildlife Club, Hare/Hofmann/Huff, Victor W. Herlevick, and Maki-Gemmer-Johnson.

Three Industrial scholarships are available each year. In addition to cash awards of $2000 - $4000, the Industrial Scholarships provide practical work experience with industrial forestry organizations. Industrial Scholarships are supported by grants from Canal Wood Corporation, Georgia Pacific Corporation, and Squires Timber Company.

Approximately 15 Work-Study Scholarships are awarded each year, generally to juniors and seniors. Work-Study Scholarships, currently at $3600 each, carry a work requirement, which is usually satisfied by assisting with operational activities on the college forests. This requirement means that recipients must be advanced students with some field skills. Four endowments provide these awards: Biltmore Forest, James L. Goodwin, George K. Slocum, and Dan K. Spears.

Scholarship applications or questions should be directed to Dr. Richard Braham, Scholarship Coordinator
phone: (919) 515-7568, fax: (919) 515-8149, e-mail: richard_braham@ncsu.edu.

Cooperative Education, Internships, and Summer Work Experience

Practical work experience is an important component of the professional degree programs in the Department of Forestry and Environmental Resources. Experience may be gained through participation in the Cooperative Education Program, summer work, and internships The department has close ties with employers in forestry, wildlife, and natural resources and provides placement assistance for the work experience programs. The Fisheries and Wildlife Sciences Program offers summer internships with research faculty and others across the state. The Cooperative Education Program, which requires a minimum 2.25 GPA after at least one year of study (many employers require a higher minimum), involves alternating semesters or summer periods on the job with semesters on campus for classes. A total of 12 months of work experience is required. Students who successfully complete the co-op program are

in high demand by employers. Interested students should contact the department placement officer, Mr. Joseph Cox, phone: (919) 515-7576, fax: (919) 515-8149, e-mail: joe_cox@ncsu.edu.

Dual Degree Programs

Students enrolled in one of the department's degree programs who have a strong interest in another degree topic may obtain a second baccalaureate degree in addition to the primary one. Such dual degree programs may be designed to provide a broader base in a related technical field such as wood products or soil science, or to broaden the student's knowledge and skills in a supporting field such as business, economics, sociology, or political science. Joint programs require coordination of the courses required in both curricula and the additional time required to complete them depends on the similarity between the curricula and the use of electives in one to satisfy required courses in the other. One to several extra semesters may be required to complete two degrees but expanded employment opportunities are a definite benefit.

Transfer Students

The Department of Forestry and Environmental Resources accepts NC State students as on-campus transfers, as well as students with good academic records from other accredited colleges and universities. Students at community colleges or other baccalaureate institutions who plan to transfer to one of the department's degree programs should closely follow the desired curriculum by taking equivalent courses. Only equivalent courses will be credited to the appropriate degree program after enrolling at NC State, and the time required to complete the degree will depend on the courses remaining in the degree track. Students applying for the Forest Management curriculum must have at least 30 credits equivalent to those in the freshman and sophomore years and must transfer in the fall of the sophomore year in order to complete the courses required for summer camp. Formal articulation agreements exist with the four forestry programs at North Carolina community colleges and those students do not need to attend Summer Camp. Questions about transfer procedures, admissions criteria, or courses should be directed to Dr. Joseph P. Roise, Director of Undergraduate Programs, phone: (919) 515-7783, e-mail: joe_roise@ncsu.edu.

Curriculum in Forest Management

The curriculum in Forest Management is a professional program accredited by the Society of American Foresters that has long been ranked as one of the best among the 50+ such programs in the country. The Forest Management curriculum satisfies the education requirements to become registered (licensed) by the North Carolina State Board of Registration for Foresters. With a rigorous math and science base, the curriculum produces graduates with a broad education in natural sciences, humanities and social sciences, communications skills, computers, and the technical knowledge and skills needed for sound management of the multiple resources of natural and managed forest ecosystems. Preparatory courses in the freshman and sophomore years are followed by the 9-week forestry summer camp where the woods knowledge and field skills that are essential for all foresters are acquired. Core courses of the junior and senior years focus on forest ecosystem processes, applied economics, operational practices in the forest stand management, measurement and analysis of forest stand components, policy issues in natural resource management and the management decision-making tools and skills needed to develop and implement forest management plans.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Concentrations

The Forest Management curriculum allows some specialization through 18 hours of coursework in one of the following concentrations.

Forest Business
Designed for students interested in the financial aspects of forestry, especially wood procurement and economics.

Forest Biology
Designed for students interested in a more broadly based education more suitable for admission to graduate school.

Forest Management
Designed for students interested in general forestry ranging from land management to wood procurement.

International Forestry
Designed for students interested in the global dimensions of forestry.

Urban Forestry
Designed for students interested in community forestry in urban settings.

Related Fields
Designed for students interested in obtaining a minor in a related discipline especially economics, entomology, horticulture, soils, or parks and recreation.

Forestry Summer Camp

An intensive, full-time, 9-week summer camp with training in the Coastal Plain, Piedmont, and Mountain regions of North Carolina is required in the Forest Management curriculum. The camp is based at the college's Hill Demonstration Forest with trips taken to

other regions. Students take summer camp after the sophomore year and earn 9 semester credits in courses that provide a base of knowledge and skills for the advanced courses in the junior and senior years.

Opportunities

Graduates in Forest Management are in high demand by state and federal land management agencies, forest products companies growing wood as a raw material, investment firms and insurance companies with land ownership portfolios, state forestry and agriculture extension services, the Peace Corps, environmental and wetland consulting firms, wood procurement companies, nursery and landscape management firms, and environmental organizations. After several years of experience, many graduates start their own businesses in forestry and land management consulting. Some graduates continue their education in graduate school to specialize in a wide variety of forestry and related programs.

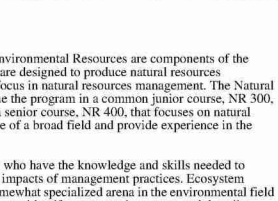
Minor in Forest Management

The Forest Management minor is open to all undergraduate degree students at NC State, except majors in Forest Management, who are interested in learning the basics of the structure and functioning of forest ecosystems and the policies and practices of forest management. The minor will be useful to students in related career fields that wish to have a better understanding of the scientific and policy issues involved in the sound stewardship of the nation's forests. The minor will also be useful to students who may be responsible for management of natural resources or interacting with foresters.

The minor in Forest Management requires a minimum of 15 credit hours, in one of two options, either FOR 172, FOR 212, FOR 252 and 6 hours of electives; or FOR 172, FOR 212 and attend forestry summer camp. Students who wish instruction and field experience in forestry technical skills should choose option 2 and attend Forestry Summer Camp. For additional information, contact Dr. Joseph P. Roise, Director of Undergraduate Programs phone: (919) 515-7783.

Minor in Wetland Assessment

The Undergraduate Minor in Wetland Assessment is an interdisciplinary, interdepartmental minor that is designed to provide the requisite knowledge of skills needed for entry-level competence in wetland delineation and assessment. The soils, hydrology, and plant identification courses of the minor build the scientific background and skills needed to understand the structure and functions of wetland ecosystems and to apply assessment protocols. The capstone course, NR 421 Wetland Assessment, Delineation, and Regulation, focuses on further development of knowledge and skills in applying wetlands assessment, delineation, and regulation procedures. The Undergraduate Minor in Wetland Assessment consists of 17 credit hours. BO 405 and FOR (NR) 420 are prerequisites of NR 421, and therefore, must be completed before enrolling in NR 421.



Curricula in Natural Resources

The two natural resources curricula offered by the Department of Forestry and Environmental Resources are components of the campus-wide baccalaureate degree program in Natural Resources. The curricula are designed to produce natural resources professionals with a broad interdisciplinary background coupled with a specific focus in natural resources management. The Natural Resources curricula begins with a common introductory course, NR 100, continue the program in a common junior course, NR 300, that focuses on natural resources measurements, and compete the program with a senior course, NR 400, that focuses on natural resource management. These common courses will highlight the integrated nature of a broad field and provide experience in the important professional practice of working together in interdisciplinary teams.

The curriculum in Natural Resources Ecosystem Assessment produces graduates who have the knowledge and skills needed to inventory and describe the characteristics of natural ecosystems and evaluate the impacts of management practices. Ecosystem assessment or environmental impact assessment is an extremely important and somewhat specialized arena in the environmental field that requires individuals who understand ecosystem structure and processes; who can identify, measure, inventory, and describe ecosystems; and who can apply standard evaluation and classification systems such as wildlife habitat evaluation procedures and the federal wetland delineation criteria. To the strong science base of the core, advanced courses in sampling and measurements, vegetation, soils, hydrology, and wildlife and fisheries is added. Many of the 400-level courses also address techniques and issues of natural resource management.

The curriculum in Natural Resources Policy and Administration will produce graduates who have the knowledge and skills to manage natural resources programs in a variety of settings and organizations with an emphasis on public agencies. The advanced courses of the curriculum provide a broad background in economics, policy, government, public administration, and natural resources management. An economics track begins with introductory microeconomics and culminates with environmental economics and public finance. Courses in government and public administration provide in-depth knowledge of how public institutions work. Courses in forestry, wildlife and fisheries, and outdoor recreation provide techniques of managing natural ecosystems for various uses. A common thread of how public policy on natural resources is influenced and developed runs through many of the courses already noted and culminates in two senior courses that focus on policy. For information on entrance requirements, contact the program coordinator: Dr. George Hess, Department of Forestry and Environmental Resources, NCSU, Box 8002, Raleigh, NC 27695-8002, phone: (919) 515-7437, fax: (919) 515-8149, e-mail: george_hess@ncsu.edu. Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

Graduates of the Natural Resources Ecosystem Assessment curriculum are needed in a wide variety of public agencies, non-governmental organizations, and private companies. The U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the N.C. Division of Water Quality, and county and city governments employ graduates to help manage compliance with county, state, and federal environmental regulations, particularly wetlands and protected species. Non-governmental organizations and private engineering and environmental consulting firms employ graduates to prepare habitat maps, environmental impact statements and assessments, delineate wetlands, and conduct searches for threatened or endangered plant and animal species. The broad background in natural resources provided by this curriculum also provides a strong base for students interested in graduate school or environmental law.

The curriculum in Natural Resources Policy and Administration is designed to produce administrators and managers for public agencies and private organizations that are involved with management, administration, policymaking, preservation, or regulation of natural resources. Examples are the USDI National Park Service, the US Environmental Protection Agency, the US Geological Survey, state and local government agencies, and not-for-profit environmental organizations. The broad background in government, economics, policy, and natural resource management also provides a strong base for students who wish to pursue a graduate program in natural resources economics and policy.

Curriculum in Environmental Sciences/Watershed Hydrology

Hydrology is the science of water that is concerned with the origin, circulation, distribution, and properties of the waters of the earth. Watershed hydrology is the application of that science to the study of the storage, movement, and quality of water in the context of the natural landscape unit, the watershed, and the effects of human's activities on that water. The curriculum in Environmental Sciences— Watershed Hydrology produces graduates who have the knowledge and skills needed to analyze the hydrologic functioning of watersheds, to plan and implement watershed management practices, and to deal with the ecologic, social, political, and economic aspects of water resources problems. The Environmental Sciences core provides a strong education in the basic physical, biological, and mathematical sciences; the humanities and social sciences; and the structure and functions of natural ecosystems. Advanced courses of the concentration in Watershed Hydrology focus on hydrologic processes in watershed; applications of hydrology in environmental management; skills of measurement, analysis, and communication; and computer applications. For information on entrance requirements, contact the program coordinator: Dr. James D. Gregory, Department of Forestry and Environmental Resources, NCSU, Box 8008, Raleigh, NC 27695-8008, phone: (919) 515-7567, fax: (919) 515-6193, e-mail: jim_gregory@ncsu.edu

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

The increasing stresses on water resources resulting from population growth maintains the demand for hydrologists in a variety of career positions. Hydrologists are needed in research, technical, environmental assessment and management positions in a variety of federal and state agencies and private organizations. The Environmental Sciences, Watershed Hydrology curriculum meets the criteria of the US Office of Personnel Management for the position of Hydrologist. Graduates are qualified to serve as hydrologists in federal agencies such as the US Geological Survey, US Forest Service, US Army Corps of Engineers, and the USDA Soil Conservation Service. State agencies such as the Office of Water Resources and the Division of Environmental Management are also excellent sources of employment. In the private sector, hydrologists are needed by environmental consulting firms and environmental organizations and by companies that own and manage large areas of forested, agricultural, or urbanized land. The rigorous scientific and quantitative background in the field of hydrology in this curriculum also provides excellent preparation for students who wish to pursue a graduate program in water resources.

Curriculum in Environmental Technology

Environmental Technology focuses on the assessment of impacts to the environment and the technology for managing those impacts. This curriculum prepares graduates to collect data, analyze and interpret those data, and determine appropriate solutions for sound environmental management. Many Environmental Technology courses emphasize hands-on training with state-of-the-art monitoring equipment. An internship to obtain actual working-world experience is required. For information on entrance requirements, contact the program coordinator: Terrie Litzenberger, Department of Forestry and Environmental Resources, NCSU, Box 8008, Raleigh, NC 27695-8008, phone: (919) 515-7581, fax: (919) 515-6193, e-mail:terrie_litzenberger@ncsu.edu.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

Career opportunities include technical positions with: firms that offer environmental services; manufacturing companies that are required to maintain sophisticated environmental monitoring networks; consulting and audit firms that perform independent environmental audits; and state and federal regulatory agencies. A number of graduates have also pursued graduate degrees.

Curricula in Fisheries and Wildlife Sciences

The Department of Forestry and Environmental Resources administers the Fisheries and Wildlife Sciences Program, which is shared with the Department of Zoology in the College of Agriculture and Life Sciences. The undergraduate curriculum prepares the student for the Bachelor of Science in Fisheries and Wildlife Sciences degree concentrating in either Fisheries or Wildlife. The program emphasizes application of ecological principles to management of fisheries and wildlife populations and habitats. The curriculum

integrates biological sciences with social sciences, mathematics, physical sciences, and speciality courses in fisheries and wildlife to give students a well rounded undergraduate education and to prepare students for graduate school.

The Fisheries and Wildlife Sciences Program facilitates and provides opportunities for student internships, cooperative education and professional society interactions that are extremely valuable in preparation for future employment. The Student Chapter of the Leopold Wildlife Club, and the North Carolina Chapter of the American Fisheries Society offer students in all levels of study the opportunity to network, to perform community service, and to learn from professionals in their chosen field. For information on entrance requirements, contact the program coordinator: Dr. Richard Lancia, Coordinator, Fisheries and Wildlife Sciences Program, Department of Forestry and Environmental Resources, NCSU, Box 7646, Raleigh, NC 27695-7646, phone: (919) 515-7586, fax: (919) 515-5110, e-mail: richard_lancia@ncsu.edu.

Fisheries and Wildlife Summer Program

Three courses comprise the six-week summer session that is required of all fisheries and wildlife majors. These courses, offered at Hill Forest, a residential camp about one hour from Campus, provide the opportunity for intense study and practical application in fisheries and wildlife sciences. One week of the session is at Great Smoky Mountains National Park on the border of Tennessee and North Carolina.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Fisheries

The objective of the fisheries sciences minor is to provide students, who might pursue careers in related areas of natural resources management, with basic ecological and management knowledge about fisheries resources. Additionally, the minor will provide students majoring in unrelated fields an appreciation for the value of fish resources and the need for sound management.
Requirements: 15-16 credits

Number	Title	Credits
FW 221 or ZO 260 or BO 360 or FOR 260	Conservation of Natural Resources; Evolution, Behavior & Ecology; Intro Ecology[a]; Forest Ecology	3 - 4
FW (ZO) 420	Fishery Science	3
FW (ZO) 423	Intro. Fisheries Science Lab	1
ZO 419	Limnology	4
ZO 441	Biology of Fishes	3
ZO 442	Biology of Fishes Lab	1

a. BO 355 1 credit, optional

Minor on Wildlife

The objective of the wildlife sciences minor is to provide students, who might pursue careers in related areas of natural resources management, with basic ecological and management knowledge about wildlife resources. Additionally, the minor will provide students majoring in unrelated fields an appreciation for the value of wildlife resources and the need for sound management.
Requirements: 16-17 credit hours

Number	Title	Credits
FW 221 or ZO 260 or BO 360 or FOR 260	Conversation of Natural Resources; Evolution, Behavior & Ecology; Intro Ecology; Forest Ecology[a]; Forest Ecology	3-4
FW 353	Wildlife Management	3
FW 453	Principles of Wildlife Science	4

a. BO 365 1 credit, optional

Choose 2 courses from the following list:

Number	Title	Credits
FW 403	Urban Wildlife Management	3
FW 404	Forest Wildlife Management	3
FW 460	International Wildlife Mgmt. & Conservation	3

Opportunities

Graduates are prepared for graduate school and entry-level professional positions in state and federal government agencies, non-profit organizations and private industry. Upon graduation, students are qualified to seek certification from The Wildlife Society or the American Fisheries Society.

DEPARTMENT OF PARKS, RECREATION AND TOURISM MANAGEMENT

Biltmore Hall, Room 4008
phone: (919) 515-3276
website: natural-resources.ncsu.edu/ptm/.

D. Wellman, Head
C. G. Vick, Undergraduate Coordinator
B. Wilson, Graduate Coordinator

M. A. Kanters, Director of Professional Golf Management Program

Professors: H.A. Devine, M. Floyd, K.A. Henderson, J.C. Peel, C.D. Siderelis, J.D. Wellman; Professors Emeriti: P.S. Rea, M.R. Warren; Associate Professors: A. Attarian, G.L. Brothers, L.D. Gustke, M.A. Kanters, Y. Leung, R.L. Moore, C.G. Vick, B.E. Wilson; Research Associate Professor: P.K. Baran; Assistant Professors: J. Bocarro, J. Casper, H. Grappendorf; Teaching Assistant Professor: E. Lindsey, R.W. Wade; Senior Lecturer: K. Hamilton-Brown; Lecturers:C.S. Kline, A.C. Moore, S. Tomas; Part-time Lecturers: M.G. Bekolay, D.E. Carter, J.I. Connors, J.E. Fels, B. Honeycutt, P. McKnelly, J.B. Shields

The department offers interdisciplinary programs allowing students to focus on careers in park management, recreation, tourism, golf management or sports. Standards adopted by the recreation profession make college graduation a requirement for employment. NC State University has an established reputation for comprehensive, professional education in the study of parks, recreation, tourism, golf and sport management. The department offers a curriculum in Professional Golf Management, Parks, Recreation and Tourism Management, and Sports Management.

Opportunities

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. A recreation and park professional's goal is to influence people to use their discretionary time wisely and to improve the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; state agencies, such as state parks; federal government, with agencies such as the National Park Service, Corps of Engineers, and U.S. Forest Service; resorts and country clubs; and sport agencies.

Other major employers include youth and family service organizations, such as the YMCA, YWCA, Boy's Clubs, and Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments, such as resorts, private clubs, theme parks, and convention and conference centers. Sport management is also a growing profession with a variety of career opportunities.

Curriculum in Parks, Recreation and Tourism Management

The curriculum in Parks, Recreation and Tourism Management offers a broad, general education background, basic professional and technical courses, and the opportunity to specialize in a particular field. General education courses are in natural sciences, psychology, sociology, English, mathematics, communication, and economics. A specialized course is required in statistics.

The curriculum is designed to prepare men and women for a variety of positions in a dynamic and challenging profession. The focus of the curriculum is on management rather than face-to-face leadership. The curriculum provides 37 hours of professional course work that includes recreation philosophy, management techniques and skills, fiscal management, supervision, facility and site planning, programming, administration, and analysis and evaluation.

In addition to the general education requirements and the core professional requirements, students can begin to attain specialized training through concentration courses. They choose one of the following concentrations: tourism and commercial recreation, park and natural resource management, or program management.

Academic studies on campus are supplemented by practical laboratory experiences in the Raleigh area, out-of-state field trips and study opportunities, and a 10-week internship with a park, recreation or tourism agency. Cooperative work-study programs are available. Study abroad opportunities are also encouraged.

Concentrations

Park and Natural Resource Recreation (18 hours)
Prepares students for positions planning, managing and maintaining parks and other natural resource oriented areas at the federal, state, regional or local levels and in settings ranging from primitive to urban.

Tourism and Commercial Recreation (18 hours)
The tourism and commercial recreation concentration prepares students for positions in planning, marketing and managing tourism facilities, attractions, and products. The positions could be with private companies, nonprofit groups or public agencies.

Program Management (18 hours)
Prepares students to develop and manage organized recreation activities for individuals and groups.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Curriculum in Professional Golf Management

NC State University is one of a select few universities across the United States to offer a PGA of America Accredited Bachelor of Science degree in Professional Golf Management. Located in the heart of a great golf state, NC State's PGM program, in partnership with the College of Management and the College of Agriculture and Life Sciences, is uniquely qualified to become one of the best in the nation.

The golf profession today requires expertise in a variety of areas, including turf grass management, retail operations and merchandising, food and beverage management, personnel management, accounting, risk management, marketing, and customer services in addition to teaching golf. A unique interdisciplinary combination of golf management, business, life sciences, turf grass management, food & beverage management, parks, recreation and tourism management courses, with extensive co-op experiences, will help students become leading professionals in the golf industry.

In addition to PGM course requirements, PGM students will complete 16 months of cooperative education at approved golf facilities. PGM students are also required to complete all requirements for levels one, two, and three of the PGA-Professional Golf Management Apprentice Program prior to graduation.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula or www.natural-resources.ncsu.edu/pgm

Curriculum in Sport Management

The Sport Management degree provides students with high quality educational experiences to enable their success as managers in sport and sport related industries and organizations. NC State's Sport Management program will provide students with a multidisciplinary perspective that includes sound management principles combined with a global understanding of sport and the impact of sport in social, economic, political and technological environments. Sport can be viewed as both an industry and an academic discipline. This program will educate students in the theoretical principles of sport management as well as the application of those principles. The interdisciplinary curriculum, including courses in recreation and accounting, will enable students to develop leadership, communication, evaluation and problem-solving skills in a "real world" environment.

The curriculum provides 37 hours of professional course work that includes recreation philosophy, management techniques and skills, sport finance and economics, sport law, programming, administration, and analysis and evaluation. Students can use the 27 hours of free electives in this program to pursue a minor or design a special track that will meet their career goals. Academic studies on campus are supplemented by a 10-week internship with an approved sport agency.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Parks, Recreation and Tourism Management

The academic minor in Parks, Recreation and Tourism Management is offered to students interested in gaining a basic knowledge of the parks, recreation and tourism fields and an understanding of the importance of leisure and recreation in American society. It is not intended to prepare students for a professional career in parks, recreation, sport, and tourism. Six hours of required courses and nine hours of electives are necessary to complete the minor. The program provides a background in recreation and park management which is useful to students who will assume full-time careers associated with recreation and park services and become involved in the

park and recreation field as a volunteer, program leader, or policy making board member with such organizations as the Scouts, Y's, art advisory councils, and conservation organizations.

Admission
Any undergraduate student enrolled in the university as a degree candidate is eligible for admission to the minor program. The undergraduate curriculum coordinator of Parks, Recreation and Tourism Management will advise students regarding their plan of work and process all necessary records.

Requirements for Admissions and Completion
Students should see the minor adviser, Dr. Candace Goode Vick for both admission and certification of the minor. She can be reached at (919) 513-0350, or candace_goode@ncsu.edu. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Paperwork for certification should be completed no later than during the registration period for the student's final semester at NC State.

Requirements:
- A minimum of 15 hours (5 courses required to complete the minor in Park, Recreation & Tourism Management)
- Student must take PRT 152 and PRT 358
- A grade of "C-" or better is required in all courses to be used toward the minor.

DEPARTMENT OF WOOD AND PAPER SCIENCE

Biltmore Hall, Room 2105
phone: (919) 515-5807

S. S. Kelley, Head
R. A. Venditti, Director of Graduate Programs
M. V. Byrd, Undergraduate Coordinator, Paper Science and Engineering
P. N. Peralta, Undergraduate Coordinator, Wood Products

Alumni Distinguished Undergraduate Professors: H. Jameel, J.A. Heitmann, Jr.; Alumni Distinguished Graduate Professor and Elis & Signe Olsson Professor: H. Jameel; Buckman Distinguished Scientist: M.A. Hubbe; Professors: D. Argyropoulos, J. Denig, J.A. Heitmann, Jr., H. Jameel, S.S. Kelley, A.G. Kirkman, M.J. Kocurek; Research Professors: R.L. Lemaster, J.S. Stewart; Professors Emeriti: A.C. Barefoot, H.M. Chang, E.L. Deal, E.L. Ellwood, I.S. Goldstein, C.A. Hart, R.G. Hitchings, L.G. Jahn, M.W. Kelly, H.G. Olf, R.G. Pearson, R.J. Thomas, E.A. Wheeler; Adjunct Professors: S. Banerjee, L.L. Edwards, H.L. Hergert, B. Kasal, R.B. Phillips, J.J. Renard; Associate Professors: M.A. Hubbe, L.A. Lucia, P.H. Mitchell, P.N. Peralta, I.S. Peszlen, O.J. Rojas, R.A.Venditti; Adjunct Associate Professors: J.W. Skowronski, H.A. Stewart, J. Wiedenbeck; Associate Professors Emeriti: R.C. Allison, R.C. Gilmore, S.J. Hanover; Assistant Professors: M.V. Byrd, J.J. Pawlak; Adjunct Assistant Professor: S. Zauscher; Research Assistant: W.S. Bryan

The wood-based industry of North Carolina, as well as throughout the South, is a vital part of the nation's economy. In terms of the dollar value of shipments of wood and paper products, the South leads all regions of the country. North Carolina manufactures more wood household furniture than any other state, ranks third in shipment value for all wood and paper products, and is second in the number of employees and wages paid. Thus, many opportunities exist in North Carolina and other southern states for careers in the wood-based industry.

The Department of Wood and Paper Science offers two curricula leading to Bachelor of Science degrees- Paper Science and Engineering, and Wood Products. Both curricula prepare men and women for careers in the wood, paper, and allied industries or in government agencies connected with wood resources.

Curricula in Paper Science and Engineering

M. V. Byrd, Undergraduate Coordinator

The Paper Science and Engineering curriculum prepares students for careers in the paper industry, which ranks as the fifth-largest manufacturing industry in the United States. Science, engineering, and mathematics form the basis for a multidisciplinary approach to understanding the fundamental manufacturing principles involved. Students study the technology and engineering of wood pulping processes, chemical and by-product recovery systems, and pulp bleaching. In addition, various papermaking operations, such as refining, sizing, coating, and drying are studied. These topics along with the chemistry of wood, pulping, and papermaking, and the physics of paper as it relates to product characteristics and design form a fundamental core of courses that all students in the curriculum take.

Two concentrations are available emphasizing the different engineering aspects of pulping and papermaking. The Paper Science and Engineering concentration provides an extensive background in the pulp and paper manufacturing processes and elective credit hours for studies in chemistry, marketing, economics, management or other areas of interest to the student. Greater depth in general chemical engineering principles can be obtained from the Chemical Engineering Concentration. Students who have completed the Chemical Engineering Concentration in Paper Science and Engineering can, in cooperation with the College of Engineering and with an additional semester of study, earn a Bachelor of Science in Chemical Engineering as a second degree.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Program Educational Objectives

The Paper Science & Engineering program strives to produce graduates that will be recognized by the following attributes as they work in the industry:

- They have mastery of the fundamentals of physical, mathematical and engineering sciences, analytical problem solving, engineering, experimentation and design, and information technology;
- They can grasp and apply engineering and scientific principles and procedures to solve complex, real-world problems;
- They understand the economic, social and environmental implications of their decisions;
- They are able to communicate effectively for various audiences and purposes;
- They participate in intra-group and cross-functional teams to solve technical, non-technical and broader business issues;
- They have a wide perspective of the paper industry and its relationship to society;
- They possess a strong sense of professional responsibility, ethics, and awareness of people's needs as they function in industry;
- They continue their education and learning to maintain their technical skills;
- They have broadened their non-technical education to further enhance their job skills and aspects of their personal lives.

Opportunities

Graduates of this curriculum find opportunities for challenging careers as process engineers, product development engineers, process control engineers, chemists, technical service engineers, quality control supervisors, and production supervisors. Design and construction engineering companies employ graduates as project engineers, and pulp and paper machinery companies use their education and skills for technical service and sales positions. Opportunities for managerial and executive positions are available to graduates as they gain experience.

The broad and intensive nature of this curriculum makes graduates attractive not only to the pulp and paper industry, but to a variety of other major chemical process industries. This appeal is especially true for the dual degree in Paper Science and Engineering and Chemical Engineering.

Summer Internships and Co-ops

All Paper Science and Engineering majors are required to work one summer in a pulp or paper manufacturing facility. One hour of academic credit is granted after completion of 12 weeks of this work and presentation of an engineering report of professional quality. In addition, students are urged to work in manufacturing facilities the other two summers, as the work provides valuable practical experience. Departmental advisers assist students in locating summer jobs, which are found throughout the US and some are even international.

Many Paper Science and Engineering students work at least one co-op rotation, in which they leave school for one semester and work in the industry. The resulting experience adds significantly to a student's desirability upon graduation.

Accredited Program

The Paper Science and Engineering program is accredited by ABET, the Accreditation Board for Engineering and Technology.

Regional Program

The Paper Science and Engineering curriculum is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field.

Scholarships

Approximately 125 undergraduate academic scholarships are granted annually to new and continuing students by more than 50 companies comprising the Pulp and Paper Foundation.

Minor in Paper Science and Engineering

The Paper Science and Engineering Minor is available to all undergraduate students enrolled in the university as degree candidates, except Paper Science and Engineering Majors. The minor requires 15 credit hours. Six hours of required courses provide a comprehensive overview of pulping and papermaking science and technology, including pulping, bleaching, chemical recovery, recycled fibers, papermaking, coating, printing, converting, and paper properties. Nine elective hours may be chosen from areas including wood chemistry, wet end chemistry, unit operations, process design and analysis, project management, paper physics, process control, or to gain more in depth exposure to the basic pulping, bleaching, and paper making process.

The Paper Science and Engineering Minor, with its focus on papermaking science and technology, is intended to be especially valuable to students majoring in programs leading to careers in corporate or government positions which would interface with the paper and related industries. Students interested in business, scientific or engineering specialties, which may interface with, or are employed by these industries will find the minor especially useful.

Admissions and Certification of Minor
All undergraduate students enrolled in the university as a degree candidate, other than PSE majors, are eligible for admission to the PSE minor program. The PSE Minor Adviser will serve as adviser and certify completion of the minor. Paperwork for certification must be submitted to the minor adviser no later than the registration period for the student's final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate form his or her degree program. Contact Person: Dr. John A. Heitmann, Minor Adviser, 2111 Biltmore Hall, (919) 515-7711.

Curriculum in Wood Products

P. N. Peralta, Undergraduate Coordinator

The wood products industry is of major importance to the economy of North Carolina and the Southeast. It ranks third in the state in the value of shipments, behind only textiles and tobacco products, and it is second to textiles in the number of employees. The career opportunities for graduates with a B.S. in Wood Products are excellent. The Wood Products curriculum is a material science curriculum based on the renewable, natural resource, wood. The anatomical, physical, mechanical, and chemical properties of the material are emphasized and the 15 semester hours of technical electives and the 9 hours of free electives in the base curriculum allows the student to select courses to meet individual career goals.

There are two concentrations available in Wood Products— Manufacturing and Business Management. The Manufacturing concentration provides a concentrated exposure to Industrial engineering principles and practices. This concentration is for the Wood Products students who have as career goals either process and product engineering or upper level plant management in a large wood manufacturing company. Students competing the Manufacturing concentration earn a minor in Industrial Engineering. The Business Management concentration provides a concentrated exposure to business management practices, including financial and operations management, accounting practices, and marketing. This concentration is for the Wood Products students who have as career goals owning an enterprise or having responsibility for the business operations aspect of a company and who desire acquiring business management skills to complement the technical background in wood. Students completing the Business Management concentration earn a minor in Business Management.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Opportunities

Graduates have a strong foundation in the production and processing of wood products and find numerous opportunities for careers in the wood industry. Entry positions are frequently as quality control technicians in composite plants, process or product engineers in the furniture industry, or in sales with the huge supplier industries, such as finishes, equipment, glues, and hardware. Advancement to positions of increased responsibilities comes quickly to those with dedication and active involvement in career development.

Scholarships

There are seven endowed scholarships within the program and seven non-endowed industrial scholarships. These are awarded on merit through a selection process involving faculty and industrial representatives.

Accreditation

The Wood Products curriculum is accredited by the Society of Wood Science and Technology.

Minor in Wood Products

The Wood Products minor is available to all undergraduate students, except Wood Products majors, enrolled in the university as degree candidates. Due to the various semester credit hours of the elective courses, the semester hours required for this minor may be as low as 17 or as high as 20 credits. Eleven hours of required courses provide a general background in wood anatomy, physical properties, and wood-based composites. Elective courses (minimum two courses required) may be chosen from areas including wood processing, wood mechanics, quality control, and plant infrastructure.

The Wood Products minor, with its focus on wood properties and processing, is designed to be especially valuable to students majoring in programs leading to careers in areas such as structural design, furniture manufacturing, and forestry. Students interested in natural and renewable materials will also find the minor useful.

COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

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College of Physical and Mathematical Sciences

The College of Physical and Mathematical Sciences offers programs for students whose interests lie in the basic as well as the applied physical science and mathematical areas. These programs of study and research are offered at both the undergraduate and graduate levels and lead to many career opportunities. In addition, the college provides the core physical science and mathematical education support for the entire university. The college consists of five academic departments: Chemistry, Mathematics, Physics, Statistics, and Marine, Earth, and Atmospheric Sciences. It jointly administers academic programs in Biochemistry with the College of Agriculture and Life Sciences. The Center for Research in Scientific Computation, the Institute of Statistics, the State Climate Office, and the Center for Marine Science and Technology are also associated in whole or in part with the college.

Graduates of the college are in demand and valued for their well-developed analytical thinking and problem-solving skills. They are recruited for technical and administrative positions in industry and laboratories, universities and colleges, non-profit research organizations, and government agencies. A large percentage of the graduates undertake advanced study in medical, law, business, or other professional schools as well as further study leading to the Master of Science and Doctor of Philosophy degrees.

The high school student who enjoys computers, mathematics, statistics, chemistry, geology, marine science, meteorology, or physics; who has an interest in natural phenomena and their fundamental descriptions, and who hopes to make a difference in the quality of life should consider the career opportunities opened by degrees in the physical and mathematical sciences.

Degree Programs

The college offers undergraduate programs of study leading to the Bachelor of Science degree with majors in chemistry, geology, mathematics, applied mathematics, meteorology, natural resources, environmental sciences, physics, and statistics and the Bachelor of Arts degree with majors in geology, chemistry, and physics. In some programs, students may choose to highlight their studies with concentrations in compatible disciplines. For example, they may select an earth systems history concentration in geology; an air quality, geology, or statistics concentration in an environmental sciences curriculum; or marine and coastal resources concentration in a natural resources curriculum.

Curricula within the college have similar freshman years enabling a freshman to change from one department to another in the college without loss of time. A time-limited Physical and Mathematical Sciences Undesignated (PMU) "curriculum" is offered to students who want to major in one of these curricula but have not yet made a decision.

Minors are offered in geology, mathematics, meteorology, physics, and statistics.

Pre-Medical Sciences

Medical and dental schools as well as many other health-related professional schools have long regarded degree programs in the core physical and mathematical sciences as excellent preprofessional curricula. Some professional schools prefer the in-depth knowledge gained by this route over those curricula which offer a cursory view of a variety of topics. For further details, contact Dr. Anita Flick, Director of pre-Health Advising.

Dual Degree Programs

Students may wish to earn bachelor's degrees in two fields within the college. Other students may wish to combine a bachelor's degree in the college with one in another NC State college. With effective planning a number of courses can satisfy core, general education, or elective requirements simultaneously in both degree programs. For example, many students choose to pursue simultaneous degrees in mathematics and mathematics education or one of the physical sciences and science education.

Student Activities

In addition to university-wide extracurricular activities and honor organizations, the College of Physical and Mathematical Sciences has student chapters of the following professional and honor organizations: Sigma Pi Sigma (Physics Honor Society); Society of Physics Students; Pi Mu Epsilon (National Mathematical Honor Fraternity); Society for Undergraduate Mathematics (A Student Chapter of the Mathematical Association of America); Phi Lambda Upsilon (National Honorary Chemical Society); American Chemical Society; Alpha Chi Sigma, national co-ed professional chemistry fraternity, National Organization for the Professional Advancement of Black Chemists and Chemical Engineers; Mu Sigma Rho (Statistics Honorary Society); Statistics Club; American Meteorological Society; Society of Mining Engineers/Society of Exploration Geophysicists (Geology Club); National Association of Environmental Professionals (Student Chapter); and the nation's first chapter of the Society of African-American Physical and Mathematical Scientists. In addition, majors in the college are eligible for induction in the national honor societies: Phi Beta Kappa and Phi Kappa Phi.

Honors Program

All departments in PAMS have active honors programs, designed to encourage excellent undergraduates to pursue a program that will challenge their abilities and better prepare them for their post-graduate career, through a combination of independent research and honors course work, often at the graduate level. Students in an honors program are advised by honors advisers who help students customize their education based on their individual interests, talents and skills and who proactively present opportunities for academic study, research and study abroad. For information on a particular departmental program, please visit the departmental web sites.

Facilities

Faculty and students within the college have access to an extensive array of computational and network services. Extensive use of computers to fulfill the daily task requirements encompasses word processing, e-mail, information access from the library and Internet, and the use of numerous specialized software tools. The college provides a large number of workstations for use by undergraduate and graduate majors and is a participant in the university's campus-wide workstation network. Individual departments either utilize these workstations or provide additional platforms for work with discipline specific programs; for example instruction or research in mathematics, statistics, satellite data acquisition and analysis, weather modeling, chemistry, or physics. Additionally, students have access to university facilities for additional workstations, peripherals, and services. There is a fully staffed help desk to assist students with problems that they might encounter.

Cooperative Education, Field Experience, and Undergraduate Research

The college recognizes the value of career-related work experience to students and encourages its majors to avail themselves of such opportunities whenever possible. That experience may be gained through the university's Cooperative Education Program, department sponsored field experience, academic research, and summer employment. Advisers work with students to develop a plan of study that balances a challenging course load with appropriate extracurricular activities.

Scholarships

College of Physical and Mathematical Sciences majors may be eligible for a variety of freshman and undergraduate college and departmental scholarships in addition to those administered at the university level. The awards are based on a combination of factors, with a strong emphasis on academic excellence. Some scholarships are renewable for up to four years, and some carry opportunities for significant career-related work experience.

Community Outreach

The college of Physical and Mathematical Sciences demonstrates its commitment to community outreach primarily through its Science House. The Science House offers programs for K-12 students and teachers to enhance their understanding of, appreciation for, and involvement in mathematics and physical sciences. The Science House, located on the Centennial Campus, houses classrooms, laboratories and a teaching resource library. Vans from the Science House carry Science on the Road demonstration programs and teaching laboratory equipment to schools across North Carolina.

Tutorial and Audio-Visual Assistance

Most of the departments in college offer students some form of free tutorial assistance, including regularly scheduled review sessions and Supplemental Instruction (SI) for selected sections of chemistry, mathematics, and physics. Several departments provide facilities for students to use supplementary videotaped or computer assisted instructional materials on a voluntary basis.

Graduate Study

The Master of Science and Doctor of Philosophy degrees are available with majors in biomathematics, chemistry, marine, earth, and atmospheric sciences, mathematics, applied mathematics, statistics, and physics. The Master of Biomathematics, Master of Chemistry, and Master of Statistics are also offered. The Departments of Statistics, Mathematics, and Physics offer B.S.-M.S. programs that allow students to enroll in up to twelve credit hours of graduate level course work that may be applied toward the requirements of both the bachelor's and master's degrees.

DEPARTMENT OF CHEMISTRY

Dabney Hall, Room 108; Marye Anne Fox Science Teaching Laboratory
phone: (919) 515-2546

M.G. Khaledi, Department Chair
K. W. Hanck, Associate Department Chair and Director of Facilities
P.A. Brown, Director of Undergraduate Studies
E. F. Bowden, Director of Graduate Studies

Howard J. Schaeffer Distinguished Professor: B.M. Novak; Glaxo Distinguished University Professor: J.S. Lindsey; Alumni Distinguished Undergraduate Professor: A.J. Banks; Alumni Distinguished Undergraduate Professor Emeriti: F.C. Hentz, Jr., W.P. Tucker; Professors: E.F. Bowden, D.L. Comins, S.F. Franzen, C.B. Gorman, K.W. Hanck, M.H. Khaledi, J.D. Martin, D.C. Muddiman, D.A. Shultz, G.H. Wahl, M-H. Whangbo, J.L. Whitten; Professors Emeriti: R.D. Bereman, C.L. Bumgardner, H.H. Carmichael, L.D. Freedman, F.W. Getzen, S.T. Purrington, A.F. Schreiner,E.O. Stejskal, R.C. White; Associate Professors: C.B. Boss, T.B. Gunnoe, M.T. Oliver-Hoyo, A.I. Smirnov, W.L. Switzer; Associate Professor Emeritus: T.C. Caves, Y. Ebisuzaki, D.W. Wertz; Assistant Professors: A. Deiters, R.A. Ghiladi, L. He, Elon Ison, P.A. Maggard, Jr., C. Melander, A.A. Nevzorov, T.I. Smirnova; Research Assistant Professors: M. Taniguchi, A.G. Tkachenko; Associate Faculty: D.W. Brenner (Materials Science and Engineering); Teaching Associate Professors: P.A. Brown, K.A. Sandberg, L.E. Sremaniak; Lecturers: J.C. Folmer, M.T. Gallardo-Williams, A. Ison, G.A. Neyhart, L.M. Petrovich, R.W. Warren; Laboratory Supervisors: M.L. Belisle, P.D. Boyle, J.L. Burtness, G.L. Hennessee, M.M. Lyndon, S.S. Sankar; Laboratory Demonstrator: S.G. Cady

Honors Program

To be invited to join the Chemistry Honors Program at the end of the sophomore year, a student must have a GPA of 3.25 or higher. Only students in the Chemistry B.S. program will be invited to join.

Chemistry Honors students must maintain a GPA of at least 3.25 to graduate with honors. In addition, the departmental requirements for students in the Honors Program are the completion of 9 extra credit hours of work that is NOT required for their degree(s). Between 3-6 credit hours can come from research conducted in laboratories in the Department of Chemistry. Research in other laboratories of molecular sciences may also be considered. However, in the latter case, prior approval is required. A 3-page report and a letter from the supervisor indicating the nature of the work, time spent in the lab, and performances are required at the end (before finals week) of the semester, in which the research is conducted. It should be noted that simply working in a research lab does not necessarily meet the requirements of the Honors Program. The nature of the work must be meaningful research. The rest of the credit hour requirements can be met with 500 level or higher courses in chemistry, biochemistry, polymer sciences, materials sciences, biotechnological sciences and pharmacological sciences. Courses in other subject areas may be considered. However, prior approval is required. If you are in doubt as to whether a particular course will count toward the Chemistry Honors Program, please contact Professor T. Brent Gunnoe at brent_gunnoe@ncsu.edu.

Curricula

The B.A. program offers a flexible course of studies for students who may not plan to become professional chemists but who desire an interdisciplinary program with an emphasis on chemistry. The proper choice of electives will prepare the graduate for any of the following: medical, veterinary or dental school; work in chemical sales and management; teaching in secondary schools; work in environmental science; or graduate school in an allied science. Since the first three semesters are essentially identical to those of the B.S. program, students may enter the B.A. program either directly from high school or some later point after entering the university.

The B.S. curriculum, accredited by the American Chemical Society, includes a strong, broad background in mathematics, physics, and the liberal arts. The basic areas of organic, physical, inorganic, and analytical chemistry are stressed. Laboratory and classroom work develop the skills, knowledge, and inquiring spirit necessary for a successful career in chemistry. The advised elective credits allow individual diversity at the junior and senior levels. Many undergraduates participate in current departmental research through part-time employment or research projects. The B.S. curriculum prepares the student to enter the job market directly as a chemist or to enter various professional schools or graduate school in chemistry or an allied science. This route is also an excellent premedical program.

The Bachelor of Science in Chemistry-Marine Sciences Concentration provides students the knowledge associated with a B.S. degree in Chemistry, but also applies that knowledge to a natural environmental setting (in this case, the marine environment). Many students have an environmental awareness and a desire to pursue environmental issues along with their interest in physical science. This degree allows a student to take all of the courses necessary to become an accredited ACS (American Chemical Society) chemist along with the oceanography courses necessary to apply that chemical information to an interesting and complex environment like the ocean.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

DEPARTMENT OF MARINE, EARTH AND ATMOSPHERIC SCIENCES

Jordan Hall, Room 1125
phone: (919) 515-3711

J. C. Fountain, Head
C. J. Thomas, Director of Undergraduate Programs

Langley Professor: R. Tolson; University Distinguished Scholars: R.R. Braham, T.F. Malone; Alumni Distinguished Undergraduate Professors: V.V. Cavaroc, Jr. Emeritus, E.C. Knowles Emeritus; Professors: V.P. Aneja, S.P. Arya, N. Blair, D.J. DeMaster, D.B. Eggleston, R.V. Fodor, J.P Hibbard, G.S. Janowitz, D.L. Kamykowski, Y.L. Lin, F.H.M. Semazzi, T.G. Wolcott, L. Xie; Adjunct Professors: S.W. Chang, W.J. Cooper, B. Dimitriades, S.K. Leduc, R.V. Madala, C.R. Philbrick, S.T. Rao, R.W. Reynolds, R. Rotunno, J.T. Wells; Professors Emeriti: H.S. Brown, V.V. Cavaroc, J.M. Davis, L.J. Langfelder, C.J. Leith, S. Raman, W. J. Saucier, C. Welby; Research Professor: T.F. Clark; Research Professors Emeriti: T.S. Hopkins, D.A. Russell; Associate Professors: D.P. Genereux, M.M. Kimberley, G.M. Lackmann, E.L. Leithold, P.T. Shaw, W.J. Showers, Y. Zhang; Associate Professors Emeriti: C.E. Knowles, A.J. Riordan, E.F. Stoddard, G.F. Watson, D.L. Wolcott Research Associate Professor: E.N. Buckley; Adjunct Associate Professors: B.K. Eder, R.S. Harmon, J.C. Reid, C.R. Tomas, R.W. Weiner; Assistant Professors: A. Aiyyer, Del Bhonenstiehl, J.A. Clarke, C.N. Cudaback, R. He, J. Liu, N. Meskhidze, M.H. Schweitzer; Research Assistant Professors: J. Lin, H. Mitasova, A.J. Newell, M. Peng, C.J. Thomas; Adjunct Assistant Professors: D.M. Checkley, M.J. Childress, C.J. Coats, D.R. Corbett, A.S. Frankel, A.F. Hanna, J.A. Hare, T. Holt, C. Jang, G.T. Kellison, G.J. Kirkpatrick, A.J. Lewitus, J.E. McNinch, P.A. Roelle, B. Subrahmanyam, R.C. Tacker; Lecturers: E.M. Page, J.A. Thurman; Adjunct Lecturer: R.M. Wooten; Interinstitutional Adjunct Faculty: P.J. Robinson; Visiting Scholars: J.N. McHenry, D.T. Olerud, J.M. Vukovich, J.O. Young; Visiting Research Scholar: H. Xu

The Department of MEAS covers a broad range of disciplines with one overarching goal: a deeper understanding of the Earth's environment. MEAS takes an interdisciplinary approach to studying our planet's air, earth and water, combining meteorology, earth science, and oceanography in a single department.

This interdisciplinary viewpoint is particularly important today, in light of accelerating global changes and increasing corporate and public interest in environmental health and wise use of natural resources. Many pressing questions require more than narrow training in a single discipline. MEAS graduates can be equipped for tasks as diverse as improving severe storm forecasting; assessing potential effects of oil exploration; modeling global climate trends or coastal flooding; understanding the transport of tree-killing air pollutants from industrial centers to the North Carolina mountains; developing non-polluting technology for mining; ascertaining dinosaurian physiology and ecological niches; investigating global ozone depletion, or devising plans to minimize erosion and pollution of coastlines.

MEAS offers degrees in meteorology, geology, marine sciences, environmental sciences and natural resources. Marine science majors learn how the oceans, solid earth, and atmosphere interact. Marine sciences courses are highly interdisciplinary and are available in chemical oceanography, physical oceanography, biological oceanography, coastal geology, and marine meteorology. Earth science courses encompass the entire earth, from the core, through the crust, to the minerals, sediments, ground water, and land forms of the surface. Tools learned allow students to understand and characterize the physical and historical earth. Course work in all areas of geology equips students to reduce potential disasters from geological hazards and to ameliorate the negative impact of human society on the geological resources of the earth. Selection of a paleontology focus produces graduates knowledgeable about the evolution of the earth's ecosystems. The meteorology program stresses a quantitative understanding of atmospheric structure and processes. It addresses problems like air pollution, climate changes, and severe weather, such as thunderstorms, tornadoes, winter storms, and hurricanes. Forecasting and climate studies are enhanced by using real-time satellite imagery, radar-data products, and state-of-the-art computer technology. MEAS majors in Environmental Sciences and Natural Resources fill a unique need in today's society as experts who can interpret their science to public policy shapers and decision makers. The training they receive in economics, political science, and policy issues, and management, (for Natural Resources majors) equips MEAS graduates to interact with industry, and with regulatory and conservation agencies.

Planet Earth is MEAS's natural laboratory. While most scientists conduct experiments under controlled conditions designed to replicate some facets of nature, we use ships, submarines, aircraft, satellites, and unattended monitoring instruments to directly and remotely probe the natural environment itself. Computer modeling helps us visualize the real-world information, and to design the next experiments. Field study is an integral part of MEAS educational programs, enabling students to apply concepts learned in the classroom to projects in the field. Summer field courses take students to the Southwest or to the North Carolina coast for intensive training in field methods. Shorter field trips are part of classes in all disciplines.

Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge for careers in government, industry, or academe. Many students pursue graduate degrees.

Marine Sciences graduates can go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They may conduct pure and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society's needs for dealing effectively with earth processes, such as water supply and water quality (from ecosystem health in rivers and estuaries to residential and industrial supply and disposal), or assessment of stability of land forms. They work for engineering firms and permit-issuing agencies, and they are recruited by industries that rely on geological resources. Paleontologists are familiar with the evolution of ecosystems through time, and provide a perspective on potential long-term reactions of the biosphere to both past and current changes and stresses. Their expertise is used in education, including museums, and in theoretical and practical study of biosphere response. Those with Environmental Science degrees are trained to assess and monitor geological resources like ground water contamination. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates may enjoy careers in areas such as weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits like refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Environmental Sciences graduates with an air quality emphasis may work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

Honors Program

Participants receive enhanced coverage of academic material and are involved in research. Eligibility is based on scholastic achievement. Minimum requirements are a GPA of 3.5 overall and 3.5 in the major, including required mathematics, chemistry, and physics courses taken to date. Students are reviewed for eligibility after the first semester of the sophomore year and again as first semester juniors. Participation is optional. To successfully complete the honors program, a student will acquire a minimum of 9 credit hours of honors work, including 3 to 6 hours of independent study culminating in a written scientific report, and one of the following options: oral presentation in the department, a poster presentation at the Sigma XI Undergraduate Research Symposium, or

presentation at a professional meeting. The remaining honors credit is earned in honors' sections of undergraduate courses, and in advanced (graduate) courses. Students must graduate with a 3.4 grade point average overall.

Undergraduate Research, Cooperative Education, and Internships

Honors Program participants, as many as 10 percent of MEAS undergraduates, obtain valuable experience assisting with research projects. Examples of past research projects include studies of coral reef fish in the Bahamas to understand age, growth, and life history transitions; assessment of Lake Victoria's impact on the climate of East Africa; examination of the relationship between atmospheric ozone and meteorological parameters as measured with instrumented balloons; experiments on generation of oxygen from moon rocks to supplement a manned moon station; and reconstruction of events during past volcanic eruptions on Hawaii. Outstanding MEAS students can receive career training with pay through the NC State Cooperative Education program, after completing the first year of undergraduate studies. Co-op and internship students have completed assignments with the National Weather Service, US Geological Survey, US Air Force, US Environmental Protection Agency, NC Museum of Natural Sciences, NC State Climate Office, NC Division of Marine Fisheries, NASA, local environmental consulting firms, and other state and federal agencies. Many students co-op or intern at the internationally renowned Research Triangle Park. After graduation, co-op students often are hired full-time by the same companies or agencies.

Facilities

The home base of MEAS is Jordan Hall, an award-winning structure that accommodates regular and tele-video classrooms, teaching laboratories, computing facilities, and offices of faculty and staff. Jordan Hall has several facilities housing networked computers, some for unstructured student use, and some, like the Weather Analysis and Forecasting Laboratory, for teaching. This laboratory houses 25 workstations providing access to real-time and archived satellite, radar, surface, and upper-air observations plus a wide variety of numerical model fields. From the rooftop Weather Observatory, detailed weather measurements are automatically logged and archived and weather balloons are launched. Other structures include the Research III building on NC State's Centennial Campus, which houses the Facility for Ocean and Atmospheric Modeling and Visualization (FOAM-V) supercomputing center supporting teaching, research and extension, especially in the MEAS focus on air-sea interaction. Research III also houses the State Climate Office, where many students gain skills in instrumentation, data acquisition, data analysis, and interaction with the public. For class work and field research in coastal settings, students may travel to NC State's Center for Marine Sciences and Technology on the shore of Bogue Sound, in Morehead City.

Students who attend a research-intensive ("Research I") university benefit from the opportunity to engage in research as undergraduates and to study with professors whose involvement in research keeps their knowledge and enthusiasm fresh. The faculty of MEAS are internationally acknowledged research scientists, and the department maintains an extensive inventory of both laboratory and field research equipment and facilities. As a member of the Duke/UNC Oceanographic Consortium, MEAS has access to the R/V Cape Hatteras, a 135' coastal oceanographic research vessel, which serves as a platform for work on the physics, chemistry, geology, biology and meteorology of the sea offshore. Training cruises on the R/V Cape Hatteras occur each semester, providing practical experience in oceanography for marine science majors.

Specialized equipment in the department supports teaching and research in: geological materials (electron microprobe, X-ray fluorescence spectrometer, an automated X-ray diffractometer, neutron activation analysis), geophysical measurements (GPS, gravimeter, magnetometer, seismic reflection, high-resolution sub-bottom profiler (Chirp Sonar) and swath bathymetric sonar system), and sedimentology (microcomputer-controlled grain-size analysis). Stable- and radio-isotope laboratories support research in biogeochemical cycling, paleoclimatology and paleontology. Paleontology also employs molecular techniques. Ecological studies are supported by a motion analysis system, a biotelemetry laboratory, and the departmental membership in the Cooperative Institute of Fisheries Oceanography, a joint venture of NOAA's National Marine Fisheries Service and a number of universities within the state. Advancements in air-sea interactions come through the Satellite Oceanography and Image Analysis Laboratory; the Physical Oceanographic Research Laboratory with its complement of equipment to monitor the ocean's motion and composition; the Planetary Boundary-Layer Laboratory with its instrumentation for monitoring physical processes at the land-air and sea-air interfaces; the FOAM-V facility, and the center for Marine Sciences and Technology at the coast in Morehead City, NC.

Curricula

The department offers several curricula in each of the areas of marine, earth and atmospheric sciences. Each prepares students for employment at graduation or for further professional training. There are three Bachelor of Science (B.S.) curricula in atmospheric sciences: Meteorology, Marine Meteorology, and Environmental Sciences, Air Quality. Most students in meteorology are employed with private companies and public agencies. Air quality graduates are employed by consulting firms, private industry and public agencies. The marine sciences offer five B.S. curricula with concentrations in Biological Oceanography, Chemistry, Geology, Meteorology, and Physics. Earth sciences house three curricula: B.A. (Bachelor of Arts) and B.S. in Geology, and B.S. in Environmental Sciences, Geology concentration. The B.A. and B.S. degree programs require similar core courses, but the B.A. contains more social sciences and humanities, and the B.S. more mathematics and other physical sciences. An environmental sciences degrees combine core knowledge in the science with economics, politics, and policy. Geologists are employed in both the private and public sector. The B.S. in natural resources, with a concentration in marine and coastal resources, combines marine sciences with economics, politics, policy, and management, to prepare scientists who can interface with policy-makers and regulators.

Marine Sciences Concentration in Chemistry
(See B.S. Chemistry)

Marine Sciences Concentration in Meteorology
(See B.S. Meteorology)

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Geology

The Department of Marine, Earth, and Atmospheric Sciences offers a Minor in Geology to majors in any field except geology. This program provides a means of recognition for students in any field who have a curiosity about the materials, structures, and processes of the solid earth. Admission to the program requires a grade of C or better in MEA 101 and MEA 110. Successful completion of the program requires a C- or better in at least 15 hours of geology or geophysical course work which must include MEA 101, MEA 110 and two additional laboratory courses.

Program Administrator and Contact
Department of Marine, Earth and Atmospheric Sciences
1113 Jordan Hall, Box 8208
phone: (919) 515-7776

Minor in Meteorology

The Department of Marine, Earth, and Atmospheric Sciences offers a Minor in Meteorology to majors in any field except meteorology. Admission to the program requires a grade of C or better in MA 141, 241, and 242, and in PY 205 and 208. Successful completion of the program requires a grade of C- or better in the following courses: MEA 213, 214, 311, 312, 313, 314, and 421. MEA 130 may substitute for MEA 213.

Program Administrator and Contact
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DEPARTMENT OF MATHEMATICS

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A. G. Helminck, Department Head
H. T. Tran, Associate Head
J. S. Scroggs, Director of Undergraduate Program
S. L. Campbell, Director of Graduate Program
E. L. Stitzinger, Administrator of Graduate Program
J. R. Griggs, Coordinator of Classroom Instruction
H. J. Charlton, Scheduling Officer and Director of Summer School

Professors: H.T. Banks, S.L. Campbell, M.T. Chu, L.O. Chung, J.D. Cohen, A. Fauntleroy, J.E. Franke, R.O. Fulp, P.A. Gremaud, R.E. Hartwig, A.G. Helminck, H. Hong, I. Ipsen, K. Ito, N. Jing, E.L. Kaltofen, C.T. Kelley, A. Kheyfets, T. Lada, Z. Li, X.B. Lin, R. H. Martin, N. Medhin, C.D. Meyer, K.C. Misra, M.S. Putcha, S. Schecter, J.F. Selgrade, F.H.M. Semazzi, M. Shearer, C.E. Siewert, J.W. Silverstein, M. Singer, R. Smith, E.L. Stitzinger, H.T. Tran, R.E. White; Adjunct Professors: E.M. Peck, P. Schlosser; Professor Emeriti: J.W. Bishir, E.E. Burniston, R.E. Chandler, E.N. Chukwu, J. Danby, J.C. Dunn, W. Harrington, K. Koh, J. Luh, J. Marlin, L.B. Martin, P. Nickel, C.V. Pao, E.L. Peterson, N.J. Rose; Associate Professors: M.A. Haider, A. Lloyd, S. Lubkin, L.K. Norris, S.O. Paur, J. Rodriguez, J.S. Scroggs, S. Tsynkov, D. Zenkov; Associate Professor Emeritus: G.D. Faulkner, D.E. Garoutte, L.B. Page, R.T. Ramsay, R. Savage, R. Silber, D. Ullrich, W.M. Waters; Assistant Professors: B. Bakalov, R. Buche, H.J. Charlton, A. Chertock, M. Kang, I. Kogan, D. Labate, M.S. Olufsen, T. Pang, N. Reading, K. Sivaramakrishnan, A. Szanto, D. Zenkov; Assistant Professor Emeritus: D.J. Hansen; Lecturers: B. Burns-Williams, R. Kenney, J.R. Griggs, M.S. McCollum, A. McRae

The undergraduate majors in mathematics and applied mathematics provide a core of basic mathematics courses along with flexible choices of electives, which permit both a well-rounded education and preparation for math-related careers. Students may focus their studies in financial mathematics, mathematical biology, mathematical physics, mathematical statistics, or computational mathematics. Employment objectives can be focused on quantitative careers in business or government, teaching at the secondary level, or graduate study in mathematics and/or related areas.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Academic Enrichments

Many undergraduates in the Mathematics Department participate in research programs with members of our faculty, presenting their results in both regional and national meetings. Other enrichment activities include an off-campus program, such as the NSF sponsored Research Experience for Undergraduates, the Budapest Semester in Mathematics, and the Society for Undergraduate Mathematics, a club for all students interested in mathematics, and is a Student Chapter of the Mathematical Association of America.

Talented students are encouraged to consider the 5-year Accelerated Bachelors/Masters Program (ABM). A key feature of the program is counting up to 12 hours of graduate courses to both the BS and MS degrees. Students can choose between the MS in Mathematics, Applied Mathematics, or Financial Mathematics.

Undergraduate math students have the opportunity to take courses that are part of our Financial Mathematics (FM) Professional Science Masters (PSM), and to focus their studies in the area of Actuarial Science. Faculty affiliated with FM has research interests and teaching specialties related to finance. A career that involves modeling energy futures or pricing mortgage-backed securities requires advanced training, such as the FM PSM, but the math background and problem-solving skills learned as an undergraduate provide a solid foundation for further studies in this field.

Honors Program

Students that demonstrate high aptitude in mathematics are invited to participate in the Mathematics Honors Program. The program provides intensive mentoring and preparation for graduate studies. Students are invited to join the program if they are recommended by a teacher in an upper-level math course and have a GPA of 3.5 overall in math. To complete the program, students must take MA 426, at least three graduate level math courses, and do a research project. Math Honors students often do study abroad at programs such as the Budapest Semesters in Mathematics or Math in Moscow and do funded summer research at other universities.

Awards

The department recognizes its superior students with the following annual awards: the Hubert V. and Mary Alice Park Scholarship, for an outstanding rising junior or senior in mathematics; the John W. Cell Scholarship, for an outstanding rising junior or senior in mathematics; Carey Mumford Scholarship, for an outstanding sophomore, junior, or senior in mathematics; Levine-Anderson Award, for the student who has the best performance in the William Lowell Putnam Examination (not restricted to math majors); Charles N. Anderson Scholarship, for an outstanding sophomore in mathematics; Charles F. Lewis Scholarship, for an outstanding senior who is a double major in mathematics/mathematics education; Mrs. Roberts C. Bullock Scholarship, for an outstanding mathematics major with a demonstrated interest in the English language; the Dr. Rebecca R. Bullock Memorial Scholarship Endowment, for an outstanding mathematics major with a demonstrated interest in the English language; and the Howard A. Petrea Scholarship, for an outstanding junior or senior in mathematics.

The department also has a chapter of the National Mathematical Honorary Fraternity Pi Mu Epsilon. Membership is open to those students with superior performance in mathematics courses.

Minor in Mathematics

The minor program consists of the successful completion with a grade of C- or better of any 15 hours selected from the Department of Mathematics' list of approved courses. The list includes MA 225 Foundations of Advanced Mathematics as well as any MA courses at the 300, 400, and 500 levels.

DEPARTMENT OF PHYSICS

Cox Hall, Room 110
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M. A. Paesler, Head
R. A. Egler, Assistant Head
S. P. Reynolds, Director of Undergraduate Programs
H. Ade, Director of Graduate Programs

Named Professors: D.E. Aspnes, J. Bernholc, G. Lucovsky; Alumni Distinguished Graduate Professors: G.E. Mitchell, R.J. Nemanich; Alumni Distinguished Undergraduate Professors: R.J. Beichner, C.R. Gould, D.G. Haase, S.P. Reynolds; Professors: H. Ade, D.E. Aspnes, R.J. Beichner, J. Bernholc, J.M. Blondin, R. Chabay, S.R. Cotanch, D.C. Ellison, R.E. Fornes, C.R. Gould, D.G. Haase, C.R. Ji, C.E. Johnson, J. Krim, G. Lucovsky, L. Mitas, G.E. Mitchell, J.R. Mowat, R.J. Nemanich, M.A. Paesler, S.P. Reynolds, J.S. Risley, C.M. Roland; Professors Emeriti: J.W. Cook, K.T. Chung, W.R. Davis, W.O. Doggett, G.L. Hall, A.W. Jenkins, K.L. Johnston, G.H. Katzin, F. Lado, Jr., J.D. Memory, J.Y. Park, R.R. Patty, T.M. Schaefer, J.F. Schetzina, L.W. Seagondollar, P.J. Stiles, D.R. Tilley, A.R. Young; Associate Professors: J.D. Brown, M. Buongiorno-Nardelli, H. Hallen, P.R. Huffman, M.A. Klenin, G. McLaughlin, L. Mitas, M.C. Sagui, A.R. Young; Associate Professor Emeritus: C.G. Cobb, D.H. Martin, G.W. Parker; Assistant Professors: L.I. Clarke, K.E. Daniels, D.J. Lee, T.P. Pearl, R. Riehn, K. Weninger; Assistant Professor Emeritus: H.L. Owen

Physics is the fundamental science of observation, measurement and description of the natural world. Physicists seek to establish a mathematical description of all physical phenomena, ranging from the interactions of quarks in nuclei to the collisions of galaxies in

the universe. Together with scientists in engineering and other physical, biological, and mathematical sciences, physicists collaborate to develop new materials and new insights in all areas of modern science and technology.

Curricula

The Physics undergraduate curricula provide a strong background in the fundamentals, and offers course options for deeper studies in areas of interest. Undergraduates have the opportunity to work in research laboratories with faculty in: astrophysics, atomic physics, biological physics, physics education, nuclear and particle physics, synchrotron radiation, near-field optics, and materials physics, solid-state and condensed-matter physics. Undergraduates are frequently co-authors on scientific papers. Physics majors are part of a close-knit community- a small highly motivated group of people who have wide-ranging interests and a passion for solving problems.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Bachelor of Science in Physics

This degree equips students with a broad technical background, providing a solid basis for graduate study in physics or related sciences, enrollment in professional schools such as law or medicine, and employment in government or industrial laboratories.

Bachelor of Arts in Physics

This degree offers a flexible course of studies for students who may not plan to become professional physicists but who desire an interdisciplinary program with a strong emphasis on physics. The proper choice of electives will help to prepare the graduate for professional careers in education, law, business, journalism, or graduate school in an allied science. It is especially suitable as part of a double major or as preparation for high-school teaching. Since the first four semesters are essentially identical to those of the B.S. program, students may enter the B.A. program either directly from high school or at some later point after entering the university.

Honors Programs

The Department of Physics Honors Program offers students the opportunity to develop their academic potential by increased involvement and participation in physics study and research. A minimum GPA of 3.5 in physics courses and overall GPA of 3.0 is required for admission. Students must complete three (3) hours of PY 499, Independent Research, and submit a written scientific report based on their research. Students must also complete an additional nine (9) hours of upper-level physics courses drawn from the following two categories: 300- and 400- level physics courses taken with the honors option, and 500-level physics courses.

Minor in Physics

The Department of Physics offers a minor in physics to majors in any field except physics. To complete the minor, 17 hours of specified physics courses are required, consisting of PY 205, 208, 407 (or 201, 202, 203) and two of PY 328, 341, 401, 402, 411, 412, 413, 414, 415.

DEPARTMENT OF STATISTICS

Patterson Hall, Room 201
phone: (919) 515-2528

S. G. Pantula, Head
L. A. Stefanski, Assistant Head and Co-Director of Graduate Programs for Statistics
P. J. Arroway, Co-Director of Graduate Programs for Statistics
J. Riviere, Director of Biomathematics Graduate Program
Z. Zeng, Director of Bioinformatics Research Center
W.H. Swallow, Director of Undergraduate Programs in Statistics

William Neal Reynolds Professor: M. Davidian, Z. Zeng; Drexel Professor of Statistics: A.A. Tsiatis Alumni Distinguished Graduate Professors: B.B. Bhattacharyya, M. Davidian; Alumni Distinguished Undergraduate Professors: J.M. Hughes-Oliver, W.H. Swallow; Alumni Distinguished Research Professor: A.A. Tsiatis; Professors: B.B. Bhattacharyya, P. Bloomfield, D.D. Boos, C. Brownie, M. Davidian, D.A. Dickey, T.M. Gerig, M.L. Gumpertz, J.F. Monahan, S.G. Pantula, K.H. Pollock, D.L. Solomon, L.A. Stefanski, W.H. Swallow, A.A. Tsiatis, Z. Zeng; Research Professor: N. Sedransk; Adjunct Professors: J.C. Brocklebank, J.R. Chromy, R.B. Conolly, J.H. Goodnight, P.D. Haaland, J.M. Hoenig, N.L. Kaplan, P.H. Morgan, D.W. Nychka, R.D. Wolfinger, S.S. Young; Professors Emeriti: F.G. Giesbrecht, H.J. Gold, A.H.E. Grandage, T. Johnson, L.A. Nelson, C.H. Proctor, C.P. Quesenberry, J.O. Rawlings, D.L. Ridgeway, R.G.D. Steel, J.L. Wasik, O. Wesler; Associate Professors: M. Fuentes, S. Ghosal, S.K. Ghosh, J.M. Hughes-Oliver, S.V. Muse, T.W. Reiland, C.E. Smith, D. Zhang; Teaching Associate Professor: P.J. Arroway; Adjunct Associate Professors: H.X. Barnhart, A.S. Kosinksi; Associate Professor Emeritus: A.C. Linnerud; Assistant Professors: H.D. Bondell, K. Gross, L. Li, W. Lu, J.A. Osborne, E.A. Stone, J. Tzeng, H. Zhang; Research Assistant Professor: D.M. Nielsen; Teaching Assistant Professors: P.J. Arroway, J.R. Thompson, K.S. Weems, R. Woodard; Adjunct Assistant Professors: G. Bobashev, S.R. Browning, M.G. Ehm, J.S. Kimbell, M.W. Lutz, E.R. Martin; Assistant Professor Emeritus: B.J. Stines; Visiting Lecturer: W.F. Hunt; Senior Statistician: S.B. Donaghy

Statistics is the body of scientific methodology that deals with the logic of experiment and survey design, the efficient collection and presentation of quantitative information, and the formulation of valid and reliable inferences from sample data. The Department of Statistics provides instruction, consultation, and computational services on research projects for other departments of all colleges at

North Carolina State University including the Agricultural Research Service. Department staff are engaged in research in statistical theory and methodology. This range of activities furnishes a professional environment for training students in the use of statistical procedures in the physical, biological and social sciences and in industrial research and development. The Department of Statistics is part of the Institute of Statistics, which includes Department of Biostatistics and Statistics at Chapel Hill.

Opportunities

The importance of sound statistical thinking in the design and analysis of quantitative studies is reflected in the abundance of job opportunities for statisticians. Industry relies on statistical methods to control the quality of goods in the process of manufacturing and to determine the acceptability of goods produced. Statistical procedures based on scientific sampling have become basic tools in such diverse fields as weather forecasting, environmental monitoring, opinion polling, crop and livestock estimation, market research, and business trends prediction. The development and testing of new drugs and therapies requires statistical expertise, and advances in genomic science provide tremendous opportunities for statistical work. Because one can improve the efficiency and use of increasingly complex and expensive experiment and survey data, the statistician is in demand wherever quantitative studies are conducted.

Scholarships and Awards

The Department of Statistics recognizes the importance of superior academic performance through the awarding of scholarships and certificates of merit. Scholarships are available for the freshman year for the purpose of attracting academically superior students. There are two named departmental scholarships: F.E. McVay Scholarships and SAS Institute Scholarships. The department's NSF VIGRE program provides advanced training and support for outstanding juniors and seniors. The North Carolina Sate University chapter of Mu Sigma Rho, the national statistics honorary fraternity, accepts as members students who have had superior performance in statistics courses. Also, outstanding senior statistics students are recognized through the awarding of engraved plaques.

Honors Program

The Department of Statistics allows exceptional undergraduate students to design a program of study that typically includes advanced courses not ordinarily taken by statistics majors and one or two semesters of independent study or research. Students in the program complete a minimum of 9 credit hours in courses drawn from at least two of the following three categories: MA 425, MA 426, or other courses designated as appropriate by the honors adviser, 500-level courses in statistics or mathematics, and 400- or 500-level courses in independent study. Interested students should contact the Honors Adviser in the statistics department for additional information.

Curricula

The undergraduate curriculum provides basic training for a career in statistics or for graduate study and leads to the Bachelor of Science in Statistics. In addition to statistics, the curriculum includes study in mathematics, computer science, and the biological/physical sciences. While fulfilling their major elective requirements, students can either elect a minor or distribute their study across disciplines exploring the application of statistics in other fields such as agriculture and life sciences, computer science, economics and business, industrial engineering, and the social sciences. A cooperative work-study option is also available.

The Department of Statistics also advises students in the Environmental Sciences, Statistics Concentration major. The environmental sciences, whether concerned with basic research or monitoring the status of environmental health, are heavily involved in experimental and/or sampling design, collection of data, data analysis and interpretation. Statistics is the science of designing efficient studies for the collection of data to address specific research questions, and the analysis of these data to provide understanding of the nature of the process or population under study. It is important that environmental scientists be aware of the role of statistics in research and be familiar with basic statistical methods in order to properly plan and execute these studies. The Statistics Concentration will prepare students to become a full member of an interdisciplinary research team attacking an environmental problem. Successful completion of the B.S. in Environmental Sciences, Statistics Concentration will prepare students to perform at the junior statistician level or for graduate study.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula.

Minor in Statistics

The Department of Statistics offers a minor in statistics to majors in any field except statistics. The importance of statistical reasoning to solve real world problems has been recognized by the business, government, and scientific communities. This minor program will provide students with an opportunity to become competent in the use of statistical methods to summarize information and/or provide answers to policy/research questions. Students completing this program of study will also be provided with experience in statistical computing. The typical minor program consists of the successful completion of ST 301-302, ST 371-372 or ST 421-422, and one other approved Department of Statistics course with a grade of C or better in each course. Other sets of five courses may be acceptable; see the Director of Undergraduate Programs.

COLLEGE OF TEXTILES

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Raleigh, NC 27695-8301
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fax: (919) 515-8578
website: www.tx.ncsu.edu

College of Textiles

Textiles encompasses every aspect of daily lives with applications in medicine, space, recreation and sports, fashion, personal safety, environmental improvement and control, transportation, household and geotextiles. These versatile textile materials, offer many market opportunities and are made to design specifications by a variety of modern high-speed processes, utilizing tools such as lasers, electronics and computers. Textile materials begin with the synthesis of fibers by man or by nature. The fibers may be utilized directly or by undergoing fabric formation, including the steps necessary to make fabrics useful, such as the manufacture of dyestuffs and colorants, chemical auxiliaries and finishes, and cutting and fashioning into products. In addition to the College's expertise in the production and processing of textiles, the College also has expertise in the areas of design and development and the management and marketing of textile products.

The approximately 7,500 alumni of the College of Textiles hold diverse positions. In the textile and related industries, occupations include executive management positions for major textile organizations, manufacturing management, engineering and process improvement, marketing and sales, corporate management, design, research and development, technical service, sourcing, supply chain management, quality control and personnel management. In addition, many students continue studies in graduate programs in a wide range of disciplines. These textile graduates enter an exciting arena, where they bring creativity to the design/development and management decision-making aspects to the industry. Graduates are key strategist in managing global textile-related operations. Engineering systems and products for industry, space, medical textiles, apparel, home textiles, transportation and nonwovens provide exciting opportunities.

Opportunities remain excellent, with the college maintaining one of the university's best placement records at 95% or better each year. Demand for textile graduates from NC State University is particularly strong, due mainly to the strength of the academic programs and the College's strong working relationships with industry and government. These programs are offered by two degree granting departments: Textile and Apparel, Technology and Management, and Textile Engineering, Chemistry, and Science.

Degree Programs

The College of Textiles offers a broad choice of curricula from which to choose. Bachelor of Science programs in Textile Technology, Fashion and Textile Management, Textile Engineering, and Polymer and Color Chemistry are available. These programs allow students to choose from a wide range of courses in addition to required core courses. The textile student's curriculum includes humanities, social sciences and basic sciences and may include concentrations in business, economics, industrial engineering, mathematics, physics, chemistry, computer science, or statistics. Dual degree possibilities are open to textile students, usually requiring at least two semesters of additional study. Since professional textiles study is concentrated in the last two years of the student's program, it is possible for students from junior or community colleges, or other institutions of higher learning to transfer to the College of Textiles with a minimum loss of time.

The College of Textiles offers the following graduate degrees: Master of Textiles, Master of Science in Textiles, Master of Science in Polymer and Color Chemistry, Master of Science in Textile Engineering, Doctor of Philosophy in Fiber and Polymer Science, and Doctor of Philosophy in Textile Technology and Management. For general requirements, consult the *Graduate Catalog*. By faculty agreement, candidates for the Doctor of Philosophy degree in other schools of this university may specialize in textile-related subjects. In such cases, research is usually done in textiles.

Double/Dual Degree Programs

Dual Degree Program in Textile Engineering and Chemical Engineering

This dual degree program provides for meeting all requirements for bachelor's degrees in both Textile and Chemical Engineering in only 9 semesters. Students in this dual degree program select the Chemical Processing Concentration of Textile Engineering. Graduates of this program enjoy the benefits of two engineering degree programs that have long been successful in placing engineers into exciting and well paying careers. For more information on this dual degree program, contact Jon P. Rust (jon_rust@ncsu.edu).

Eli Whitney Program in Textile and Apparel Management and International Studies

This program is being revised to include a minor as well as a major in International Studies. For more information, contact Dr. Nancy Cassill, Room 3313, Textiles Complex.

The joint program between the College of Textiles and the College of Humanities and Social Sciences allows a student to earn a B.S. degree in Textile and Apparel Management and a B.A. degree in Multidisciplinary Studies with a concentration in International Studies. This dual degree is designed to prepare students for work in the increasingly global textile industry.

The program includes all the technical course requirements associated with the Textile and Apparel Management degree. For the B.A. in Multidisciplinary Studies, students choose from among three areas of concentration: the Pacific Rim (language study in Japanese or Chinese), Latin America (language study in Spanish), or Europe (language study in German or Italian). The program, which takes five years to complete, includes overseas internships.

Merit scholarship awards are available for high-achieving students who participate in the double degree program. For more information, contact Dr. Nancy Cassill, Room 3313, Textiles Complex.

Anni Albers Scholars Program

College of Textiles, Textile Technology Program
College of Design, Art and Design Program

The Anni Albers Scholars Program, a collaboration between the NC State University College of Textiles and the College of Design, provides students simultaneously with exemplary preparation in design and in textile technology. Because NC State University has both renowned Colleges of Textiles and Design, we are in a unique position to provide undergraduate education in textile design that is unparalleled at other institutions in the US. This program improves graduates' creative flexibility and enhances employment opportunities by combining professional skills in design with high quality technological knowledge. The program is named for textile designer and artist Anni Albers who exemplifies the ideals and goals to which the program aspires.

Students completing the Anni Albers Program will earn two undergraduate degrees: a Bachelor of Art and Design from the College of Design, and a Bachelor of Science in Textile Technology from the College of Textiles.

Facilities

The College of Textiles is located on Centennial Campus, which is adjacent to NC State University's central campus. Centennial Campus is a "technopolis" that combines the university, corporate and government research and development facilities. There is no other campus or research park quite like this 1,334 acre site.

Minors

College of Textiles majors are encouraged to minor in areas outside of textiles. Of particular interest are minors in Design, Business, Foreign Language, Paper Science, and Industrial Engineering.

Honors and Scholars Program

This program offers exceptional students the opportunity to explore areas of special interest through various forms of research or independent study. Students of high academic level, after their first or second year of study, are invited to participate in this program. Special lectures, discussion groups and seminars in the freshman and sophomore years offer possibilities for future development in the honors program. Additional advising is available and recommended in order to create and define degree programs which meet students' needs. Honors sections and graduate level classes are open to these students. The College of Textiles honor student will conduct a literature review and conduct an honors research project in an area of special interest. The honors project ranges from a scholarly review of a special topic to a discussion of an experimental research problem.

Honor Society

Sigma Tau Sigma is the scholastic textile fraternity which was founded in the College of Textiles in 1929 to honor students who have a grade point average of 3.250 or higher. The main goal of this fraternity is to create a high standard of scholarship among textile students. Twice every year the local chapter selects as its prospective member junior textile students who meet the above criteria. Sigma Tau Sigma also promotes excellence by awarding a trophy to the graduating senior with the highest overall grade point average in the college.

Scholarships

The Directors of the North Carolina Textile Foundation and friends of the College of Textiles have established an outstanding freshman scholarship program for incoming freshmen, transfer into the College of Textiles and current Textile students. The College of Textiles currently has the largest college-based scholarship program at NC State University.

Centennial Scholarships are currently valued at $10,000 per year for in-state and out-of-state students. This scholarship program also offers a $7,500 enrichment fund per recipient for educational enhancement activities. Candidates must be nominated by his or her high school or home school by November 1st, or must self nominate before November 15th. North Carolina Textile Foundation (NCTF) Scholarships (total value: $20,000) and Textile Prestige Scholarships (total value: $10,000) are also awarded through the Centennial Scholarship Process. Application deadline for all Textile scholarships is December 1. Restrictions do apply. Contact Kent Hester at (919) 515-6530 for full details.

Field Trips

For certain textiles courses, it is desirable for the student to see the manufacturing process under actual operating conditions. When possible, student groups visit outstanding manufacturing plants. Trip participation may be required. Transportation costs and other travel expenses, while held to a minimum, are paid by the student in some instances.

Summer Employment

Job opportunities for summer employment are available for textile students. Placement assistance is available through the college career services office and frequently can be arranged in the student's home community.

Four-in-One Program

The College of Textiles has a program which permits a student with a baccalaureate degree from an accredited college or university to complete the requirements for a Bachelor of Science degree in Textiles, Textile and Apparel Management or Polymer and Color Chemistry after the satisfactory completion of a minimum of one year of study.

Applicants should have completed basic economics, mathematics, physics and chemistry requirements comparable with those required for the textile degree sought. Under these conditions, the student generally may complete the degree requirements in two summer sessions and two regular semesters. Students not meeting specific requirements in business, economics, sciences, or mathematics should remove deficiencies prior to entering a specific degree program, otherwise the program of study may require three or more semesters.

Each applicant's undergraduate program is considered individually and, in most cases, a complete transfer of credits is possible.

Exchange Program

Selected students enrolled in textiles are given the option to spend at least one semester studying at a different university. The following list of opportunities are available. **Brazil** - Seni Citiqt; **England** - Leeds University, University of Hull, University of Manchester Institute of Science and Technology; **Europe** - Transatlantic Textile Network, (TTN), AUTEX; **France** - ENSAIT in Roubaix, University of Lille (ENSIT); **Finland** - Tempere University; **Germany** - HSNR in Monchengladbach, RWTH in Aachen, University of Dresden, University of Munster; **Guatemala** - University of Valle; **Hong Kong** - Hong Kong Polytechnic University; **Japan** - Shinshu University; **Mexico** - ITESM; **Spain** - UPC in Terrassa.

Additional information about these exchanges can be obtained from the Academic Programs Office.

Special Services

The College of Textiles offers several services and programs which enrich its academic programs. Textile and Apparel Research is conducted on a wide variety of problems relating to the fiber, textile and apparel industries. Frequently, the problems are interdisciplinary and involve team effort. Students have an opportunity to participate in the solution to current problems. The Office of Student Services is responsible for career services and scholarship programs of the College of Textiles. The career services office brings together industry recruiters and students for interview sessions for permanent and summer employment. Alumni may also take advantage of the placement office. The scholarship function is operated by a committee. It is possible for any United States Citizen or Permanent Resident student to pursue an education in textiles through scholarships, loans or grants, as long as he or she maintains the university's academic standards.

Textile Off-Campus Program (TOP)

The College of Textiles has a selection of undergraduate courses that are offered by distance education each semester. On campus students may take these courses via the internet with departmental approval. Classes with labs may require the student to enroll in an on campus lab section. For information, please visit our website at www.tx.ncsu.edu/academic/distance or call Carolyn Krustoff at (919) 515-6622.

DEPARTMENT OF TEXTILE AND APPAREL, TECHNOLOGY AND MANAGEMENT

Centennial Campus, Room 3245
phone: (919) 515-6633

T. J. Little, Head
G. L. Hodge, Associate Head and Director of Graduate Programs
A. M. Seyam, Associate Head and Director of Undergraduate Programs

University Distinguished Professor: Joseph D. Moore Professor: A.B. Godfrey; Klopman Distinguished Professor: Behnam Pourdeyhimi; Charles Cannon Professor: S.K. Batra; Abel C. Lineberger Professor: W. Oxenham; Alumni Distinguished Undergraduate Professor: P. Banks-Lee; Professors: N. Cassill, T.K. Ghosh, M. King, T.J. Little, A.M. Seyam, M.W. Suh; Adjunct Professors: R. McMahon, D. Sikema, T. Theyson; Professors Emeriti: R.A. Barnhardt, R.A. Donaldson, A.H. El-Shiekh, W.C. Stuckey Jr., S.C. Winchester; Associate Professors: P. Banks-Lee, H.H.A. Hergeth, G.L. Hodge, C.L. Istook, T. May Lamar,

S. Michielsen, N. Powell, G.W. Smith, K.A. Thoney-Barletta; Associate Professors Emeriti: H. Davis, P.B. Hudson, T. Lassiter, M.L. Robinson; Adjunct Associate Professors: D. Shiffler, W. Harazin; Assistant Professors: M. Jones; Assistant Professor Emeritus: F.W. Massey; Instructor: L. Parillo-Chapman; Adjunct Lecturers: G. Garland, F. Gibson

The Department of Textile and Apparel, Technology and Management offers Bachelor of Science degrees in Fashion and Textile Management and in Textile Technology. The degree in Fashion and Textile Management permits the student to specialize in one of three concentrations: Textile Brand Management and Marketing, Fashion Development and Product Management, and Textile Supply Chain Management. The B.S. in Textile Technology degree offers options in Textile Design, Nonwovens, Medical Textiles, etc. Each program requires a common series of foundation courses covering the principles, fundamentals, and applications of textile technology and business.

Curricula

The B.S. in Fashion and Textile Management has three concentrations. The Textile Brand Management and Marketing Concentration focuses on studying branding strategies, consumer trends, product trends, licensed products, and the global marketplace dynamics. The Fashion Development and Product Management Concentration focuses on design and development of fashion products, integrating trend analysis, computer-aided-design, coloration, silhouette selection, pattern making, fabric selection, consumer research, costing, sourcing and quality assessment. The Textile Supply Chain Management Concentration focuses on sourcing the optimum quantities of raw materials and products to supply the brands and retailers to meet consumer demand. The program teaches how to use a series of problem solving approaches to make the logistics process efficient and cost effective. Students in all three Fashion and Textile Management concentrations may pursue global studies, including study abroad, to further enhance their understanding of global market opportunities.

The B.S. in Textile Technology offers the student a background in the technology of manufacturing, product design, product development, and evaluation of textiles. The textile technology program is both flexible and diverse, requiring students to acquire an understanding of textile processes, products, and innovations. The program involves many academic disciplines and offers a well-rounded versatile degree, which prepares graduates to accept senior textile technology positions in industry. Popular minors include Design, Foreign Language, Industrial Engineering, Business and Economics, and Nonwovens.

The Department of Textile and Apparel, Technology and Management administers the Eli Whitney Scholarship program for students wishing to undertake a study of international business in conjunction with their studies in Fashion and Textile Management. This program is currently being revised to permit a minor or a double major in International Studies, offered by the College of Humanities and Social Science for students who are earning a B.S. degree in Fashion and Textile Management. The Department of Textile and Apparel, Technology and Management jointly administers, with the Department of Art and Design, the Anni Albers Scholars Program for students wishing to double major with a B.S. degree in Textile Technology and a B.A. degree in Art and Design.

Students taking either the B.S. in Textile Technology or B.S. in Fashion and Textile Management may elect to follow one of the medical textile options offered in the College of Textiles: either Medical Textiles or Healthcare Product Management.

The Department of Textile and Apparel Technology and Management has state of the art laboratories including Digital Design Laboratory, Nonwovens Pilot Laboratory, Filament and Technology Lab, Fashion Studio, Anni Albers Design Labs, Specialty Software Computer Lab, Microscopy and Image Analysis Lab, and Textile Management Sciences Lab.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in the Sciences of Nonwovens

The minor in the Science of Nonwovens is available to all undergraduate students enrolled in the university as degree candidates, except Textile and Apparel, Technology and Management majors. The minor requires 15 credit hours. Nine hours of required courses provide a comprehensive overview of nonwoven products and processes including various manufacturing techniques, and product/process/property interactions. Six elective hours may be chosen from areas including bonding technologies, nonwoven characterization methods and nonwoven product development.

Journal

The department publishes an online electronic journal quarterly, which provides industry, government and academic personnel with the timely dissemination of textile information. With a readership in excess of 10,000 persons (industry, government, and academic professionals), JTATM serves as an effective communication vehicle regarding the latest textile innovations, both management and development, in the field. Faculty and students utilize this resource in coursework and research efforts. The Journal of Textile and Apparel, Technology and Management can be accessed at www.tx.ncsu.edu/jtatm.

DEPARTMENT OF TEXTILE ENGINEERING, CHEMISTRY AND SCIENCE

Centennial Campus, Room 3250
phone: (919) 515-6558

K. R. Beck, Head
J. P. Rust, Associate Head, Director of Undergraduate Programs
P. J. Hauser, Associate Head, Director of Graduate Programs

Burlington Industries Professor of Textile Technology: R.L. Barker; Ciba-Geigy Professor of Dyestuff Chemistry: H.S. Freeman; Kosa Professor of Fiber and Polymer Chemistry: A.E. Tonelli; Professors: K.R. Beck, T.G. Clapp, B.S. Gupta, H. Hamouda, P.J. Hauser, S.M. Hudson, W.K. Jasper, J.P. Rust; Adjunct Professors: A. Bogdanovich, D.J. Brunelle, L.D. Claxton, W.G. O'Neal, G. O'Neal, D.J. Prezant, D.J. Sikkema; Professors Emeriti: D. R. Buchanan, D.M. Cates, J.A. Cuculo, P.D. Emerson, P.L. Grady, D.S. Hamby, S.P. Hersh, C.D. Livengood, P.R. Lord, R. McGregor, G.N. Mock, M.H. Mohamed, C.B. Smith, M.H. Theil, C. Tomasino, P.A. Tucker, W.K. Walsh, W.M. Whaley; Associate Professors: D. Hinks, J.A. Joines, R. Kotek, M.G. McCord, R. Shamey; Adjunct Associate Professors: E.S. Greenhalgh, J. Kaufman, R.G. Keuhni, T. Montgomery, I.D. Shin; Associate Professors Emeriti: T.G. Rochow; Assistant Professors: R.E. Gorga, W.E. Krause, M.A. Pasquinelli, X. Zhang; Adjunct Assistant Professors: H.A. Boyter, Jr., L. Dickinson, R.A.F. Moore, I. Parker, L. Qian, H.S. Whang; Adjunct Lecturers: S. Li, C. Moses; Associate Members of the Faculty: P. Banks-Lee, S.K. Batra, W. Oxenham, R.A. Donaldson, T.K. Ghosh, B. Pourdeyhimi, R.J. Spontak, R.E. Fornes (Physics)

The Department of Textile Engineering, Chemistry, and Science offers Bachelor of Science degrees in Polymer and Color Chemistry and Textile Engineering. Students receive a fundamental knowledge of the science and engineering involved in the production of polymers, fibers, yarns and fabrics, and products based on them, and the process of dyeing and finishing.

Curricula

The B.S. in Polymer and Color Chemistry is a new, highly flexible, rigorous program that provides courses in fundamental chemistry, while incorporating some unique areas of applied chemistry in polymers and/or color chemistry. The applied courses are heavily oriented to the chemistry and technology of polymers, including polymer synthesis, extrusion and characterization. In addition, the color chemistry component of the degree includes the synthesis and application of dyes and other compounds associated with the coloration of materials, as well as the science of color perception and color measurement.

The degree program offers two concentrations: American Chemical Society (ACS) Certified, and Science and Operations. The ACS Certified concentration is designed for students wishing to pursue advanced studies in chemistry and related subjects, for instance, medical school. Each concentration incorporates a large number of electives allowing students to develop focus areas, including medical textiles, polymer chemistry, and color chemistry. More information about the degrees is available online: www.tx.ncsu.edu/pcc.

The B.S. in Textile Engineering provides a broad base of fundamental engineering courses as a foundation for studies in textile engineering. The textile engineering courses deal with the application of scientific and engineering principles to the design and control of all aspects of fiber, textile and apparel processes, products and machinery. These include natural and man-made materials, interaction of materials with machines, safety and health, energy conservation, six-sigma quality, and computer information systems. The B.S. in Textile Engineering is offered jointly with the College of Engineering. For more details about the program, see description under the College of Engineering.

Specific curriculum requirements are available online: www.ncsu.edu/registrar/curricula

Minor in Polymer and Color Chemistry

The minor in Polymer and Color Chemistry is available to majors in any field except Polymer and Color Chemistry. The program is designed to expose students to the technical and scholarly disciplines of polymer chemistry, fiber formation, color physics, dyeing, and chemical modification of fibers and fabrics, and gives them an opportunity to learn how basic disciplines are applied in an industrial environment. Any interested students should contact the Department of Textile Engineering, Chemistry, and Science for information about the minor and its prerequisites.

B.S. Degree in Textile Engineering

(See Textile Engineering curriculum in the College of Engineering)

COLLEGE OF VETERINARY MEDICINE

4700 Hillsborough Street
NCSU Box 8401
Raleigh, NC 27606
phone: (919) 513-6262, Admissions
(919) 513-6205, Recruitment
(919) 513-6212, Academic Affairs
fax: (919) 513-6197
e-mail: cvm_dvm@ncsu.edu

College of Veterinary Medicine

No specific undergraduate degree track is associated with a preprofessional veterinary medicine program. Faculty members from the College of Agriculture and Life Sciences serve as advisers to undergraduate students interested in veterinary medicine that are enrolled and pursuing a baccalaureate program usually in a science-related field. Preprofessional course requirements are listed below. After completion of the required courses, students may be eligible to apply for the professional veterinary program. Course requirements may be changed annually and are determined by the Faculty Committee on Admissions in the College of Veterinary Medicine.

Undergraduate students with interest in veterinary medicine are expected to be pursuing a baccalaureate degree (to include the social science and humanities requirements in the appropriate curriculum). Minimum requirements and course stipulations for curriculum planning should be followed through by each of the students and their preprofessional advisers in order to be knowledgeable of the requirements.

All courses listed below should be completed by the time of application to the veterinary college, except for two courses which may be pending completion in the spring semester, term, or quarter, of the year of application.

Preprofessional Course Requirements

ANS	225	Principles of Animal Nutrition	3	MA 131	Calculus for Life Management or	3
BCH	451	Principles of Biochemistry	4	MA 121	Elements of Calculus or	3
BIO	125	General Biology or	4	MA 141	Calculus I	3
BIO	183	General Biology with Lab	4	MB 351	General Microbiology	3
CH	101	Chemistry I and CH 102	4	MB 352	General Microbiology Lab	1
CH	201	General Chemistry and CH 202	4	PY 221	College Physics I and Lab	4
CH	221	Organic Chemistry I with Lab	4	PY 212	College Physics II and Lab	4
CH	223	Organic Chemistry II with Lab	4	ST 311	Introduction to Statistics	3
ENG	101	Academic Writing and Research	4		Humanities and Social Science Electives	6
GN	411	Principles of Genetics	4		Business and Finance Electives	6

Professional Degree Programs and Career Opportunities

Veterinary medicine is a science career dealing with the recognition, treatment, control and prevention of disease in animals. Career options are unlimited and varied as animal health affects the health and economic welfare of the nation. D.V.M. candidates may select several career options upon graduation. Federal government, private industry, private practice, and research and teaching activities in a university setting are all possible for licensed graduates. Successful completion of the professional training program should prepare students for appropriate North Carolina state licensing examinations. Persons interested in the professional courses offered may receive information by contacting the College of Veterinary Medicine, Student Services Office, Raleigh, NC or view the college website at www.cvm.ncsu.edu.

NC State - CVM FOR D.V.M. ADMISSIONS
Pre-requisite or Required Courses for the 2008 Admissions Cycle

Required Courses	Semester Hrs Required	NC State University Equivalent
Animal Nutrition	3	ANS 225 Principles of Animal Nutrition (3) or ANS 230 Nutrition of Domestic Animals (3) or ANS 415 Comparative Nutrition (3)
Biochemistry	3	BCH 451 Principles of Biochemistry (4)
Biology with Lab	4	BIO 125 General Biology (4) or BIO 183 Introductory Biology II (4) or ZO 160 Intro to Cellular and Developmental Zoology (4)
Business and Finance	6	Any business, finance, accounting, economics, or agricultural economics course.
Calculus or Logic	3	MA 121 Elements of Calculus (3) or MA 131 Calculus for Life and Management Sciences (3) or MA 141 Calculus I (4) or LOG 201 Logic (3)
Chemistry, General with Labs	8	CH 101 Chemistry- A Molecular Science (3) w/lab CH 102 (1) and CH 201 Chemistry-A Quantitative Science (3) w/lab CH 202 (1)
Chemistry, Organic with Labs	8	CH 221 Organic Chemistry I/lab included (4) and CH 223 Organic Chemistry II/Lab included (4)
Composition & Writing, Public Speaking, Communications	6	Any combination of the following: ENG 101 Academic Writing and Research (4), COM 110 Public Speaking (3), COM 112 Interpersonal Communications (3), COM 211 Argumentation and Advocacy (3)
Genetics	4	GN 411 Principles of Genetics (4)
Humanities and Social Sciences	6	Humanities courses include history, foreign language, arts, music, language. Social Science courses include psychology, sociology, and anthropology.
Microbiology with Lab	4	MB 351 General Microbiology (3) and MB 352 General Microbiology Lab (1) MB 411 Medical Microbiology (3) and MB 412 Medical Microbiology Lab (1)
Physics with Labs	8	PHY 211 College Physics I (4) & PHY 212 College Physics II (4) or PY 205 Physics for Engineers and Scientists I (4) and PY 208 Physics for Engineers and Scientists II (4)
Statistics	3	ST 311 or ST(BUS) 350 Introduction to Statistics

* Required courses must be completed with a "C-" or higher grade. All but two of the required courses must be completed by the end of the fall semester during which the student applies. The remaining two courses must be completed in the spring semester of the application cycle year. Required courses can not be completed in the summer sessions immediately preceding matriculation.

DEPARTMENT OF MOLECULAR BIOMEDICAL SCIENCES

C. McGahan, Head
phone: (919) 513-6220

Professors: K.B. Adler, C.F. Brownie, L.N. Fleisher, N.C. Olson, M.G. Papich, J. Piedrahita, P.L. Sannes, B. Sherry, J.E. Smallwood, D.E. Thrall; Professors Emeriti: A.L. Aronson, R.A. Argenzio, P.J. Bentley, T.M. Curtin, C.E. Stevens, C.S. Teng; Associate Professors: P. Arasu, M. Breen, G. Dean, J.E. Gadsby, J. Horowitz, L.C. Hudson, M.G. Papich, B.P. Peters, K.A. Spaulding, C.R. Swanson; Assistant Professors: J. Barnes, L. Martin, A. Pease, L. Psner, I. Robertson, M. Rodriguez-Puebla, D.S. Reddy, J. Yoder; Visiting Assistant Professor: J.P. Douglass; Research Professor: M.C. McGahan; Research Assistant Professor: J. Gookin, N. Nascone-Yoder; Clinical Assistant Professor: P. Burns, N. Campbell, J. Neel, C. Stanton; Instructor: J. Khosla

DEPARTMENT OF CLINICAL SCIENCES

A. Blikslager, Interim Head
phone: (919) 513-6230

Professors: C.E. Atkins, E.B. Breitschwerdt, M.G. Davidson, K. Flammer, R.B. Ford, B.C. Gilger, E.M. Hardie, E.C. Hawkins, B.W. Keene, N.A. Monteiro-Riviere, E.J. Noga, T.J. Olivry, E.A. Stone, M.K. Stoskopf, L.P. Tate; Associate Professors: K.F. Bowman, B.A. Breuhaus, D.G. Bristol, L.A. Degernes, R.E. Fish, S. Gardner, B.D. Hansen, M. Hauck, S. Jones, G.A. Lewbart, D.J. Marcellin, K.G. Mathews, K.R. Muñana, S.C. Roe, S.L. Vaden; Assistant Professors: A. Birkenheuser, S. Bissett, A.T. Blikslager, T.C. DeFrancesco, K. Ferris, M.R. Gerard, C.A. Harms, P. Hess, B.D. Lascelles, T. Micheu-Miller, M. Murphy, N.J. Olby, L.E. Williams; Clinical Professor: R.A. Mansmann (Director of Equine Health Studies Program); Clinical Associate Professor: W.R. Redding. Clinical Assistant Professors: S.A. Bissett, Y. Elce, K.K. Ferris, K. Harrell, S. Marks, K.M. Murphy, M.S. Rembert (Asst. Director of Laboratory Animal Resources), M. Schramme, S. Sullivan, K.H. Taylor

DEPARTMENT OF POPULATION HEALTH AND PATHOBIOLOGY

J. Floyd, Head
phone: (919) 513-6240

Professors: G.W. Almond, K.L. Anderson, H. Barnes, T. Brown, P. Carter, J. Cullen, O. Fletcher, J.G. Floyd, F. Fuller, C. Grindem, J. Guy, B. Hammerberg, M. Levy, D.H. Ley, D. Meuten, P. Orndorff, M.C. Roberts, M. Tompkins, W. Tompkins, D.P. Wages, Associate Professors: C. Altier, M.T. Correa, P. Cowen, P. Farin, J. Law, J. Levine, M.B. McCaw, B.D. Slenning, S. Tonkonogy, M.D. Whitacre, Assistant Professors: R.E. Baynes, W.A. Gebreyes, K. Linder, M. Martin, A.M. Miles, C. Pinto, G. Smit; Clinical Associate Professor: B. Baker; Clinical Assistant Professor: A.L. Cannedy, J. Flowers; Clinical Instructor: M. Alley; Research Professor: E. Havell; Research Associate Professor: S. Kennedy-Stoskopf; Research Assistant Professor: R. Gebring; Adjunct Professor: V. Schijns, X. Xia; Adjunct Associate Professor: A. Bogan, E. Gonder, L. Kooistra, D. Marshall, D. Rives, A. Scheidt, W. Starnes; Adjunct Assistant Professor: S. Clark, D. Malarkey, T. McGinn, R. Morales; Distinguished Professor: J.E. Riviere; Lecturer: S. Hunter, V. Pallatto; Poultry Extension Specialist: D. Carver; Swine Extension Specialist: M. Morrow; Director Electron Microscopy: Michael Dykstra

OTHER ACADEMIC AND ADMINISTRATIVE UNITS

Biotechnology Program

Robert M. Kelly, Director

The Biotechnology Program at NC State includes nearly 200 faculty representing 24 departments in the Colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences, Veterinary Medicine, and Humanities and Social Sciences. The program administers minors in Biotechnology at the undergraduate, M.S., and Ph.D. levels, and a Graduate Certificate Program. Research in biotechnology is multidisciplinary encompassing three main areas: molecular biology, biomolecular engineering, and cell culture. One of the unique aspects of our program is the focus on laboratory techniques, including recombinant DNA technology, PCR, gene chip/microarray technology, protein purification, and more. Many curricula offer a great deal of theory about molecular biotechnology, but few allow for the level of hands-on experience that our program does. For more information about the Biotechnology Minor and Graduate Certificate Program, please visit www.ncsu.edu/biotechnology.

Computer Training Unit

Judson Hair, Director, CPE
Chip Futrell, Associate Director
phone: (919) 515-8163

Since 1989, the NC State Computer Training Unit has been a leading provider for the IT training needs of the Triangle. CTU operates out of McKimmon Center, utilizing four dedicated, state-of-the-art labs. New classes are introduced on a tri-mester basis and tomorrow's technology is becoming a reality to hundreds of people today.

Whether an individual is looking for a single class to become familiarized with an operating system or is committed to eight weeks of certification training, the Computer Training Unit can address this need. The NC State Computer Training Unit strives to meet the needs of each student. With a hands-on approach to technology, quality training and career guidance are provided to each participant.

Visit the NC State Computer Training Unit website today at www.ncsu.edu/ctu for a complete course schedule and certification information.

Continuing and Professional Education

Judson Hair, Director
Chip Futrell, Associate Director
phone: (919) 515-2261
website: www.mckimmon.ncsu.edu/cpe.html

In keeping with the land-grant tradition of the university, Continuing and Professional Education offers noncredit education and training to all the people. CPE encompasses three sub-units: Office of Professional Development, The Computer Training Unit, and McKimmon Conference and Training Center, focusing on the development, facilitation, and delivery of continuing education and professional programs for business, industry, and other organizations. Intensive learning experiences include practical case studies, problem solving exercises, and presentations from campus as well as noncampus. Up-to-date computer training is also available on a variety of different levels and on a wide range of topics. Special efforts are made to meet the training needs of industry and government agencies through general as well as customized offerings. The university awards Continuing Education Units to participants in qualified programs. Continuing Education Units are part of a nationwide system that provides a uniform measure of attainment in noncredit educational programs.

Distance Education and Learning Technology Applications (DELTA)

Thomas K. Miller III, Vice Provost for DELTA
Betty Byrum, Business Officer
Lou Harrison, Director of Information Technology
Donna Petherbridge, Director of Instructional Services
Rebecca Swanson, Associate Vice Provost of DE Planning & Development
Kay Zimmerman, Associate Vice Provost of Marketing & Partnership Development

Vision. We seek to improve the quality of education by harnessing technology to provide ready access for all learners. In this way we hope to meet the challenges of a changing society.

Mission. Education is the key to a prosperous future for North Carolina. DELTA promotes the quality of education by extending the reach of the faculty, collaboratively applying expertise in technology and pedagogy in an efficient, effective, and service-oriented environment.

DELTA's role within the Office of the Provost is to foster the integration and support of learning technologies in NC State's academic programs, both on the campus and at a distance. DELTA coordinates the funding and production of all distance-based credit programs and courses for the university, and promotes the quality of education by extending the reach of the faculty, collaboratively applying expertise in technology and pedagogy in an efficient, effective, and service-oriented environment. DELTA

manages the university's learning technology infrastructure, including WolfWare, an in-house developed course management system, Vista, an enterprise learning management system; Elluminate, a tool for synchronous online teaching and learning, and several campus video classrooms. DELTA offers various programs and services that provide training, support, and resources for teaching and learning with technology. These services may range from developing and/or funding distance education courses and programs, to creating technology resources face-to-face instruction, to working with the colleges to create specialized, technology-delivered education programs in support of critical constituencies in our state, such as the U.S. military. For more information, please visit DELTA's website at delta.ncsu.edu.

Division of Undergraduate Academic Programs

Module 4, Flex Building
NC State Box 7105
Raleigh, NC 27695-7105

website: www.ncsu.edu/uap
phone: (919) 515-3037
fax: (919) 515-4416

Thomas E. H. Conway, Jr. Dean
John T. Ambrose, Associate Dean
Roger A. E. Callanan, Assistant Dean

Undergraduate Academic Programs Staff: M. Albidrez, B. Alexieff, J. Ambrose, T. Appling-Biel, F. Artis, A. Atkin, M. Atkinson, J. Austin, K. Baker, D. Barnes, A. Barton, G. Barthalmus, A. Bell, L. Blanton, M. Bowden, K. Bowman, S. Brandt, L. Brown, B. Bukhay, S. Burnette, D. Burton, R. Callanan, P. Cellini, E. Clegg, T. Conway, Z. Cook, M. Crossley, J. Day, J. Dockery, A. Dupont, M. Early, S. Foley, K. Franklin, C. Freeman, J. Gottlieb, K. Hauschild, J. Hawkins-Morton, M. Hood, A. Hunt, A. Irby, V. Jenkins, B. Jereb, G. Johnson, J. LaMonte, B. Langston, K. Laraway, W. LeBlanc, E. Lezan, C. Leger, D. Marlowe, S. Matney, K. McCloud, M. McConnell, R. McGraw, C. McLean, J. Moore, G. Morell, P. Moses, J. Moylan, H. Murphy, C. Newkirk-White, R. Norris, K. Outing, C. Raines, E. Reid, J. Robinson, Jo Robinson, M. Russell, M. Rust, K. Sheridan, M. Simpson, M. Sopher, P. Steinke, S. Swanson, M. Tetro, M. Toms, J. Tongsri, M. Tyson, C. Veale, K. Wallace, G. Wical, M. Wicker, L. Wilson, B. Windom, K. Ziga

NC State University's Division of Undergraduate Academic Programs promotes excellence and effectiveness in undergraduate education. DUAP is charged with the development of a coherent vision for undergraduate education, the coordination of academic policy and curricular programming, and the strengthening of all academic support programs. DUAP seeks to engage undergraduate students in a wide range of academic activities that enhance their learning and result in more profound intellectual and civic development.

Academic Support Program for Student Athletes

200 Case Athletics Center
NC State Box 7104
Raleigh, NC 27695-7104

website: www.ncsu.edu/aspsa
phone: (919) 515-2464
fax: (919) 515-1619

Philip Moses, Director

The Academic Support Program for Student Athletes provides academic support for more than 500 undergraduate and graduate students who represent NC State in NCAA (National Collegiate Athletic Association) competition. All student athletes are provided with advising and counseling support in order to allow them to balance the rigors of academic course work with the rigors of competition at the NCAA Division I level.

Cooperative Education Program

300 Clark Hall
NC State Box 7110
Raleigh, NC 27695-7110

website: www.ncsu.edu/co-op_ed
phone: (919) 515-2300
fax: (919) 515-7444

Arnold Bell, Executive Director of Development & Experiential Learning

This optional program is structured so that students will alternate semesters of study with semesters of practical work as sophomores and juniors. Academic work is spread over a three-year period to permit alternating academic semesters with work-experience semesters. Students earn a salary while they are in industry, and they may earn a sufficient income to finance much of their college education. The Co-op plan can be completed in five years, during which time the student receives 12 to 18 months of industrial experience.

Students in all curricula may apply for the Co-op program if they have a grade point average of 2.25 or better. Application for admission into the Co-op program should be made early in the spring semester of the freshman year, however, later applications resulting in fewer work semesters will be considered during the sophomore year or the first semester of the junior year. Undesignated students must be admitted into a degree program prior to beginning the first Co-op assignment. Further information may be obtained from the Office of Cooperative Education, 300 Clark Hall.

First Year College
48 Tucker Hall
NC State Box 7925
Raleigh, NC 27695-7925

website: www.ncsu.edu/fyc
phone: (919) 515-8130
fax: (919) 515-8267

Carrie McLean, Director

The First Year College at North Carolina State University provides a point of entry for students who are undecided about their choice of major, but interested in the institution's mix of science, technology, professional, and liberal studies offerings.

The program employs a student-centered approach to the development of an effective teaching and learning environment. As part of that effort, the First Year College takes into account critical adjustments necessary for successful transition from the demands of high school to those of college. Based on a cognitive-developmental model that promotes the total university experience, the program brings into closer alignment the in-class and out-of-class experiences of students with the intellectual environment to achieve academic success through active involvement and responsibility for their own learning.

At the core of the program are elements of access to quality academic advising, formal and informal interactions with university faculty, support from academically successful upper-class students, guided exploration of the university and its colleges, structured reality-based discussions of issues associated with transition from high school to college and deliberate reflection on the cultural and social offerings available at the university. These elements are addressed through an orientation course taught each semester of the first year, cross-curricular advising, and a specialty programmed living/learning experience in the FYC Village. The program is structured so that time to graduation for students entering through the First Year College is no longer than for students who enter the university directly through a major.

First Year Inquiry Program
Module 4, Flex Building
NC State Box 7105
Raleigh, NC 27695-7105

website: www.ncsu.edu/firstyearinquiry
phone: (919) 515-3037
fax: (919) 515-4416

Maxine P. Atkinson, Director

The First Year Inquiry Program (FYI) is designed specifically for first year students who will take general education courses during their first year at NC State. Each FYI course, which is designated with the "Q" suffix, fulfills a general education requirement (GER). FYI faculty, for whom teaching and student success are priorities, engage FYI students through the use of "Inquiry-guided" teaching methods. The three student-learning objectives for which the FYI program strives are sharpening of critical thinking skills, enhancing development of intellectual maturity and increasing student responsibility for his or her own learning. Students further benefit from experiencing classes with a small faculty/student ratio that fosters a closer relationship among students and professor.

New Student Orientation
100-B Ricks Hall Addition
NC State Box 7525
Raleigh, NC 27695-7525

website: www.ncsu.edu/orientation
phone: (919) 515-1234
fax: (919) 515-5844

Gabe Wical, Interim Director

New Student Orientation provides newly admitted first-year and transfer undergraduate students introductory assistance and continuing services that will aid in their transition to NC State. Our programs expose students to broad educational opportunities, academic expectations and resources, as well as social and developmental opportunities. Most importantly, we begin the process of integrating students into the life of the institution.

Office of Advising Support, Information, and Services
201 Ricks Hall
NC State Box 7577
Raleigh, NC 27695-7577

website: www.ncsu.edu/oasis
phone: (919) 513-1723
fax: (919) 513-7542

The mission of the Office of Advising Support, Information and Services (OASIS) is to provide academic information to current undergraduate students through virtual and face-to-face cross curricular advising. Some of the services we offer include:

Fellowship Advising provides information on all national fellowships and other scholarship and grant opportunities to students campus wide (www.ncsu.edu/fao).

Pre-Law Advising offers, to those seeking information regarding law school and the process of applying to law school, guidance, information, and support (www.ncsu.edu/project/prelaw).

The Virtual Advising Center supplements traditional, face-to-face advising with virtual services that provide curriculum and academic policy information online any time of the day or night (www.ncsu.edu/advising_central).

Office of Assessment
209 Ricks Hall
NC State Box 7105
Raleigh, NC 27695-7105

website: www.ncsu.edu/assessment/assess.htm
phone: (919)515-6433
fax: (919) 515-4416

Allen Dupont, Director

The Office of Assessment in the Division of Undergraduate Academic Programs provides support for continuous program improvement for all departments and units serving undergraduate students. The Assessment staff provides training, analysis, and support for on-going assessment of student learning and development. Assessment of student learning outcomes aligns directly with the NC State mission and promotes a culture of learning, improvement, and accountability. We are expected to evaluate all that we do in order to continuously improve student learning and development.

Transition Program
208 Language & Computer Labs
NC State Box 7105
Raleigh, NC 27695-7105

website: www.ncsu.edu/transition
phone: (919) 515-7053
fax: (919) 515-4416

Frankye Artis, Director

The Transition Program is a program of support and challenge, which is designed to help students who demonstrate academic or transitional need attain academic success. Students do not apply to the Transition Program; rather, the Office of Admissions refers to the Director of the Transition Program a select set of applications from students who meet criteria for admission to North Carolina State University, but do not meet the requirements for acceptance into the first and second choice majors to which they applied. The Director reviews applications and offers a pre-determined number of students admission to the university through the Transition Program. All students admitted to the program must sign a program contract that commits them to participate in specially designed activities, both personal and academic, during their freshman year.

Undergraduate Research
202 Ricks Hall
NC State Box 7105
Raleigh, NC 27695-7105

website: www.ncsu.edu/undergrad-research
phone: (919) 513-4187
fax: (919) 515-4416

George T. Barthalmus, Director

The Office of Undergraduate Research supports and promotes excellent undergraduate opportunities in discovery-, inquiry- and creativity-based scholarship through mentored research experiences with NC State faculty and other national and international scholars and professionals. Undergraduate Research is scholarly study in any discipline in which independent scholarship culminates in advancements in science, technology, engineering, business, the arts, or humanities. Any student chosen by a mentor may participate in undergraduate research. Students from any discipline can engage in the excitement of scholarly research and present their work at quarterly symposia. Research and travel grants are available. Motivated students from high schools, community colleges, and universities from North Carolina, the nation, and the world are invited to participate.

Undergraduate Tutorial Center
1005K Ricks Hall Addition
NC State Box 7118
Raleigh, NC 27695-7118

website: www.ncsu.edu/tutorial_center
phone: (919) 515-3163
fax: (919) 515-5844

Barbara B. Windom, Director

The Undergraduate Tutorial Center provides free academic assistance to undergraduates enrolled in 100- and 200- level (and 300-level Statistics) classes. Students can choose to meet weekly with a one-on-one assigned tutor, meet with tutors by appointment, or use available drop-in services. Supplemental Instruction (SI) leaders provide a series of weekly help sessions for students in selected large lecture classes. Writing and Speaking Tutorial Services (WSTS) provides assistance to anyone in the university community who needs help on writing or speaking assignments.

Students may become a tutor for the UTC if they have an established GPA of 3.0 or better and at least a B+ in the course(s) they wish to tutor. All new tutors are required to take ECI 210, Introduction of College Tutoring during the first semester of employment.

University Honors Program
219 Clark Hall
NC State Box 8610
Raleigh, NC 27695-8610

website: www.ncsu.edu/honors
phone: (919) 513-4078
fax: (919) 513-4392

Richard L. Blanton, Director

The University Honors Program (UHP) recruits and provides programmatic support to a nationally outstanding and diverse group of students drawn from all the undergraduate colleges at NC State. The UHP stimulates, supports, and empowers its students to participate in the research and extension and engagement missions of NC State. The UHP provides innovative seminars that support its research focus by emphasizing inquiry and discovery, as well as the broader implications of new knowledge. It offers

experimental learning courses to enable students to earn academic credit for research and service projects on campus or in the community. Our students culminate their undergraduate careers with a significant capstone project under the guidance of a faculty member or other professionals. The University Honors Village living-learning community provides a supportive home for many of our participants, and presents them with opportunities to develop their leadership and social skills and to engage in informal learning through study trips, special courses, field trips, and other activities.

The Graduate School

T.L. Lomax, Dean
D. K. Larick, Senior Associate Dean
R. C. Ruffy, Associate Dean
M. Carter, Associate Dean
D. M. Shafer, Assistant Dean
R. Liston, Assistant Dean

The Graduate School provides instruction and facilities for advanced study and research in the fields of agriculture and life sciences, design, education, engineering, natural resources, humanities and social sciences, management, physical and mathematical sciences, textiles, and veterinary medicine.

The school is currently composed of more than 2,000 graduate faculty members within the ten colleges. Educated at major universities throughout the world and established both in advanced teaching and research, these scholars guide the university's graduate student body of some 5,800 men and women from all areas of the United States and many other countries.

The faculty and students have available exceptional facilities including libraries, laboratories, modern equipment, and special research areas. For a list of graduate degrees offered at NC State and details on programs and admissions, consult the *Graduate Catalog*.

Information Technology Division

S. F. Averitt, Vice Provost for Information Technology
M. A. Vouk, Associate Vice Provost, Director High Performance and Grid Computing
G. W. Sparks, Director, Communications Technology
D. V. Norris, Director, Computer Operations and Facilities
S. N. Martin, Director, Computing Services
J. Webster, Director, IT Security Services
C. A. Galloway, Director, Systems
S. W. Klein, Director, Technology Support Services and NC State University Help Desk

NC State has a tradition of offering its students a leading-edge academic computing environment. Information technology is now an important part of most aspects of NC State student life. Many NC State administrative and academic units are involved in providing online services, information, and other resources for students. Academic computing resources are provided by individual colleges and central IT units.

The Information Technology Division (ITD) designs and supports campus-wide IT infrastructure and academic computing systems and services that are available to all NC State students, faculty and staff. These include the campus multi-gigabit network backbone, a growing wireless computing infrastructure, high-speed Internet access (ResNet) for students living in campus housing, the multi-platform (Window, Unix, Macintosh) distributed academic computing system called Unity, hundreds of software packages available for student use from computing labs, e-mail systems, the university's central web servers, file space, classroom technology support (ClassTech), high performance computing (HPC) for researchers and students in computational science, and friendly Help Desk support staff available to help students and others use the resources available.

All NC State students, faculty and staff automatically receive Unity computing accounts (or Eos/Unity accounts for engineering students). These accounts provide access to the campus-wide academic computing environment, e-mail services, an allocation of network file space with support for personal web pages, and access to Unity computing labs, software applications, and the Internet. Unity/Eos accounts and file space can also be accessed via ResNet and off-campus Internet service providers. The leading-edge Virtual Computing lab provides remote access to high-end applications and HPC facilities. Instructions for logging into accounts and finding help with learning the system are provided during student orientation sessions, online, in Unity computer labs, and from the NC State University Help Desk.

All NC State students may use Unity computer labs. They are equipped with Windows, Unix, and Macintosh workstations that provide direct access to the resources of the Unity computing environment. Colleges and academic departments support additional computing facilities, and overall there are more than 80 student-computing labs on campus, with over 2500 workstations with high-speed network connections available for student use. NC State does not require all students to own computers, although specific colleges or programs may make this requirement. Information about computer recommendations, specifications, and purchasing options are published online and updated each semester.

For the most current information about NC State's computing resources, including online tutorials, student-owned computer recommendations, and acceptable use rules and regulations, see www.ncsu.edu/it/essentials. Visit the NC State University Help Desk located in Room Hillsborough Building. Check the online Help database at: help.ncsu.edu or call 515-HELP (4357), or send e-mail to help@ncsu.edu.

McKimmon Center for Extension and Continuing Education (MCE&CE)

website: www.mckimmon.ncsu.edu

Denis S. Jackson, Assistant Vice Chancellor for Extension, Engagement, and Economic Development

As a key component of Extension, Engagement, and Economic Development, the McKimmon Center for Extension and Continuing Education (MCE&CE) facilitates and enhances access to the academic resources of the campus by a wide range of audiences. Units within MCE&CE provide professional expertise in the identification of educational needs and the development of relevant programming in collaboration with the faculty, departments, colleges and external constituents; in the management and implementation of noncredit offerings; in the operation of a full-services, state-of-the-art conference facility; in the delivery of technical assistance and applied research; and in the evaluation and outcome assessment of programs and services delivered.

Specifically, the McKimmon Center for Extension and Continuing Education

- develops and delivers noncredit continuing education programs to meet the professional development or training needs of business/industry, governmental agencies and nonprofit organizations and communities,
- offers customized programs for diverse clients,
- stimulates interest in the development and delivery of relevant noncredit distance education offerings,
- identifies opportunities for joint initiatives and assists in measuring learning outcomes and impacts,
- provides a wide array of software-specific and certification courses for individuals and organizations,
- operates the McKimmon Conference and Training Center which is a large, flexible facility that hosts educational meetings for groups ranging in size from 5 to 1,200,
- provides opportunities for lifelong enrichment for people over the age of 50 through a robust learning-in-retirement program,
- conducts program evaluation and outcomes research, survey research, technology application and customized consulting services for federal/state/local governmental agencies and nonprofit organizations,
- performs a key role in the public schools statewide testing and accountability program,
- serves as the campus provider of Continuing Education Units (CEUs) that are earned through participation in approved noncredit courses, and
- coordinates and manages the annual Connecting-in-North Carolina (CINC) tour for faculty and key administrators to enhance the three-fold mission of our land-grant institution, and
- affords opportunities for students in collaboration with the University Honors Program and Service Learning Program

The McKimmon Conference and Training Center

Judson Hair, Director
Valerie Jones, Assistant Director, Reservations and Client Relations Department
Freddie Sinclair, Assistant Director, Physical Environment and Technical Services
phone: (919) 515-2277

The McKimmon Center provides the meeting facilities, audiovisual equipment, and support services for adult education programs. Administrative services are available to organizations that desire assistance in planning and implementing conferences, short courses and other educational activities. Catering coordination provided by the staff is beneficial to the planning and successful implementation of banquets and related functions. The center accommodates small meeting groups and large national and international conferences. There are 15 meeting rooms (which can be divided into 20 areas) that can be arranged for any type or size audience ranging from a typical conference room to an 1100-person theatre style hall. Four rooms are dedicated as Computer Training Unit teaching labs. Downlink teleconferencing, two-way audio-video delivery, and other technical services are available in a video production room to enhance the total learning experience.

The NCSU Libraries

S. K. Nutter, Vice Provost and Director
C. D. Argentati, Assoc. Vice Provost and Donald E. Moreland Deputy Director of Libraries

The NCSU Libraries' website (www.lib.ncsu.edu) is a rich source of information and serves as a gateway to resources and services.

The D.H. Hill Library is open 24 hours/day in the fall and spring semesters. Branch libraries include: Burlington Textiles Library, Harrye B. Lyons Design Library, Natural Resources Library, and William Rand Kenan, Jr. Library of Veterinary Medicine.

The collection contains over 3.6 million volumes of books, bound journals, and government documents; over 49,000 print and electronic serials; over 5.4 million microforms; full-text databases in all disciplines and extensive digital collections; numerous video, audio, and multimedia titles; unique and rare materials in the Special Collections Research Center. The Libraries' participation in the Triangle Research Libraries Network (TRLN) provides convenient access to the collections of Duke University, UNC-Chapel Hill, and NC Central University.

The library has approximately 240 public workstations and a full complement of equipment for audio, video, and digital resources. PC and Macintosh laptop computers, digital cameras, camcorders, and digital audio players are available for loan.

The Learning Commons in D.H. Hill Library is a newly renovated, technology-equipped space for both individual and group work. More than 100 computers are equipped with a wide range of software applications, including those used in campus labs. The Digital Media Lab in D.H. Hill Library's east wing offers equipment and assistance for creating and converting digital images and other materials. The Media Center in D.H. Hill Library's west wing has space and equipment for viewing and listening to videotapes, DVDs, and other audio-visual material. The Libraries offers a variety of study spaces for groups and individuals.

The Libraries' website (www.lib.ncsu.edu) provides information about and access to many services, including reference assistance, interlibrary loan, and electronic reserves.

North Carolina Japan Center

F. A. Moyer, Associate Director

The North Carolina Japan Center, under the University Asia Initiative in Office of International Affairs, works to promote better understanding and deeper relations between North Carolina and Japan to the benefit of our state. Activities include a wide range of outreach services and educational programs, including the annual "North Carolina and Japan: Trade Investment" Conference each fall, and periodical presentations on a diverse range of topics concerning Japanese culture and society. The center maintains a library of books, periodicals, and videotapes about Japan and a reference collection about study and employment opportunities in or relating to Japan. The Japan Center cooperates closely with the NC State Japanese language program (one of the largest in the Southeast) and provides study abroad scholarships for summer language study and full year exchange programs in Japan. For more information, please contact Francis A. Moyer at (919) 515-3450.

Office of Professional Development

Judson Hair, Director
Chip Futrell, Associate Director
website: www.ContinuingEducation.ncsu.edu
phone: (919) 515-2261

The Office of Professional Development (OPD) develops, promotes, and coordinates noncredit seminars, workshops, and conferences to a broad market on a wide range of topics. Program areas include: GMAT, GRE and LSAT test preparation; accounting and taxation; agriculture; communications; education; engineering; environmental; management; parks and recreation; substance abuse professional training; textiles; and general interest. Special events management services are available to help both campus and non campus groups more efficiently and productively administer educational seminars, workshops, and conferences.

Office of Research and Graduate Studies

John Gilligan, Vice Chancellor
Steve Lommel, Assistant Vice Chancellor for Research and Development
David Winwood, Associate Vice Chancellor for Technology Development and Innovation
Matthew K. Ronning, Associate Vice Chancellor for Sponsored Programs
Terri Lomax, Associate Vice Chancellor and Dean of the Graduate School

The Vice Chancellor for Research and Graduate Studies acts for the Chancellor and Provost in the general area of research administration for the university. The Dean of the Graduate School reports jointly to the Vice Chancellor and to the Provost. The Vice Chancellor acts as the principal liaison representative between granting agencies (federal, state, foundations, industry) and the university; assists faculty, department heads, and deans in identifying support for research programs, preparing and processing proposals, negotiating contracts, grants and cooperative agreements and developing intercollegiate and interinstitutional research programs and projects including Centennial Campus; manages the technology transfer activities of the university, administers the allocation of faculty research development funds; manages university compliance of state and federal laws, and policies; advises the Provost and Chancellor on the coordination of intercollegiate and interinstitutional research programs and facilities; and provides general information on all grant and contract activities.

University Advancement

Terry G. Wood, Vice Chancellor for University Advancement

The mission of University Advancement at NC State is to enhance the perception of and knowledge about the university through internal and external communications; to provide alumni, students, and friends with programs and services that instill loyalty and pride; to secure resources which will enhance the academic quality of the institution; to be good stewards of its endowments and advance the growth of investment at NC State; and to promote advocacy of the university. Visit the University Advancement website at www.ncsu.edu/univ_relations/univadv.html.

Advancement Services supports the operation of Alumni Relations, University Development, Public Affairs, and other units involved with the external mission of NC State by managing the donor/alumni database, conducting donor research, processing and receipting private gifts, maintaining financial records (budgets, payroll, personnel, purchasing, reimbursement, etc.), administering the corporate matching program, managing the donor prospect tracking system, providing donor stewardship, organizing stewardship/recognition activities, and staffing the needs of the NC State Foundation.

The NC State Alumni Association engages alumni through programs and services that foster pride and enhance lifelong connections to NC State. The Alumni Association strives to connect alumni to the university and its colleges through several conduits: membership; a statewide and national network of alumni clubs; programming specific to campus constituents, special-interest groups and students; events; and an array of communication tools, including the award-winning alumni magazine. The Alumni Association offers an array of membership options and a host of benefits for alumni and students who join. The Alumni Association also operates the university's annual giving program designed to raise unrestricted funds that support student scholarships as well as student and faculty recruitment. It upholds campus traditions such as the official class ring and ring ceremony, Homecoming, Founders' Day, the Evening of Stars Gala to celebrate the university's most distinguished alumni, and the Faculty Awards to recognize the achievements of NC State's outstanding faculty. The Alumni Association supports the prestigious Caldwell Fellows Program and a robust Student Ambassador Program. It offers services such as alumni travel, apparel, the official NC State credit card, student loan consolidation and insurance. Students and parents are invited to visit the Alumni Association office in the new Dorothy and Roy Park Alumni Center on the shores of Lake Raleigh on Centennial Campus. To contact the Alumni Association, call (919) 515-3375 or 800-627-2586. For a complete overview of programs, services and events, visit www.alumni.ncsu.edu.

University Development works with the colleges and programs at North Carolina State University to secure private financial support for priority projects and programs. This support may come from individuals (alumni, parents, students, faculty, staff, and friends), corporations, philanthropic foundations and other organizations.

University Development provides services to the colleges and programs in capital campaigns, gift planning, corporate, and foundation relations. University Development also facilitates external and internal communication among fundraisers, and coordinates approaches to prospective donors.

The Office of Public Affairs provides research-based public relations and marketing planning and implementation for the university, assisting and supporting the efforts of individual colleges. The goal of the unit is to build long-term relationships with key publics to strengthen the university's identity and brand image.

Public Affairs includes the offices of News Services and Creative Services. News Services promotes the university's achievements via various communication efforts, news releases, and the web. Creative Services provides publications and website design as well as video production for campus units. Public Affairs also is responsible for coordinating community relations, providing marketing support for fund-raising efforts, assisting with staging special events for University Advancement and the Chancellor's Office, and working closely with the Chancellor's Office on external affairs projects.

MUSIC DEPARTMENT

Price Music Center
Campus Box 7311
Raleigh, NC 27695-7311
phone: (919) 515-2981
fax: (919) 515-4204
www.ncsu.edu/music/
e-mail: jmark_scearce@ncsu.edu

J. M. Scearce, Director
R. M. Foy, Associate Director
J. A. Fuller, Assistant Director, Outreach and Assessment
Teaching Associate Professors: J.M. Scearce, R.M. Foy, J.A. Fuller, J.C. Kramer, M.S. Lynch, P.H. Vogel, E.B. Ward
Teaching Assistant Profssor: P.D. Garcia
Lecturer: J.W. Parker
Adjuncts: R. Waschka, A. Arnold, R. Foreman, T. Koch, R. Petters, J. Sprague, A. Sturgis, K. Turner

The Music Department is committed to providing broad-based educational opportunities for NC State students through a variety of musical experiences and introductory and upper-level academic courses. Departmental faculty seek to assist students in developing musical insights, musical skills, and the capacity to perceive and respond to music in its historical and cultural contexts.

Opportunities for direct student participation as performers include many choral and instrumental organizations. Membership in any ensemble is open to students with a disciplined interest in music. Auditions are scheduled during summer orientation, at the beginning of each semester, and by appointment with the conductor of the group. For further information, please call the Music Department at (919) 515-2981.

The department offers a variety of courses, most of which may be taken to fulfill specific general education requirements. Any course may be taken as a free elective. An eighteen-hour music minor is offered for qualified undergraduate students who wish to engage in the serious study of music. Emphases include history/literature, theory/composition, or performance— piano, vocal, or instrumental.

The department also serves as a cultural resource for the university community and the public at large through concerts presented by student musical organizations, music faculty, and visiting artists. Concerts are open to students and the public. (Also see Arts NC State pg 40).

Music

The Music Department offers an 18-hour minor in Music for qualified undergraduate students who wish to engage in the serious study of music within a curricular framework. This minor is designed to foster creative thought, aesthetic understanding, and artistic self-expression. Students may choose one of three emphases: Theory-Composition, History-Literature, Performance. Core courses include one music theory course and a two-semester survey of music in Western Civilization. Applications are available in Price Music Center, Room 203. A Bachelor or Arts degree with a focus in Music is available through the Arts Studies Program in the College of Humanities and Social Sciences.

DEPARTMENT OF PHYSICAL EDUCATION

Carmichael Gymnasium, Room 2000

March L. Krotee, Professor & Head

Professor: M.L. Krotee; Associate Professors: S.V. Almekinders, H.L. Brown, J.L. DeWitt, T.W. Evans, V.M. Leath, G.W. Pollard, T.C. Roberts, R.R. Smith; Lecturers: R.N. Bechtolt, J.A. Kagendo-Charles, K. Clark, D.A. Conner, T.S. Dash, D. DeReu, P.S. Domingue, G.T. Holden, J. Horne, T.D. Jones, R.H. Kidd, M.R. Lester, K.K. Lewis, C.S. Ousley, P.N. Powers,M.S. Rever, L.E. Scott, R. Shuford, E.V. Smith, A. Tharrington, G.E. Wall, D.P. Williamson, T.C. Winslow, G.R. Youtt; Part-time Lecturers: C. Austin, J. Barker, J. Fagg, R. Harris, M.A. Stevenson, M.A. Turnbull

All North Carolina State University students are required to complete two semesters of physical education to meet the university General Education Requirement (GER). Students must take a Physical Education 100-level course in Fitness and Wellness and one additional Physical Education activity course.

Students may participate in an activity they are familiar with or choose to experience a new activity. Students with disabling conditions will be assisted by the Department of Physical Education, Student Health Service, and Disability Services for Students in choosing appropriate classes. Only "activity" courses, not elective "theory" courses, may be used to satisfy the NC State GER physical education requirement.

Minor in Fitness Leadership

The Department of Physical Education offers a 17-hour minor in Fitness Leadership. The minor is designed to prepare students for fitness leadership responsibilities. The minor provides course work in anatomy, physiology, nutrition, and biomechanical principles; prevention and treatment of athletic injuries; development and evaluation of fitness programs. The minor also provides an opportunity to apply theory into practice through a practicum. For additional information, contact Nita Horne (919) 515-6382.

Minor in Outdoor Leadership

The Department of Physical Education offers a 17-hour minor in Outdoor Leadership that is designed for undergraduate students desiring to pursue careers as outdoor leaders of adventure-based programs or for those who wish to enhance their personal development and enjoyment. Students will develop a foundation of essential leadership skills and experience through course work focusing on outdoor skills and leadership training. Students will also have an opportunity to apply theory to practice through a practicum. For additional information, contact Terry Dash (919) 515-1392 or Dr. Tommy Holden (919) 515-6869.

Minor in Coaching Education

The Department of Physical Education offers a 17-hour Minor in Coaching Education designed to prepare students to assume coaching responsibilities with a sound theoretical and practical background. The minor provides students with a foundation of essential coaching skills and concepts as well as the basic principles of coaching philosophy, sport psychology, sport management, and prevention and care of sport related injury. The practical application of sport science, physiology, and kinesiology, as well as strategies involved in coaching specific sports, are also addressed. For additional information, contact Dr. Debra Williamson, (919) 513-6384.

Minor in Health

The Department of Physical Education offers a 16-hour minor in Health which is designed for undergraduate students wishing to pursue careers in health-related professions and for students wishing to gain in-depth knowledge in various contemporary health-related topics for their personal development. The minor provides students with theories, concepts, and practical skills concerning health behavior and includes a practicum to apply theory to practice. For additional information, contact Christopher Ousely (919) 515-6868.

MILITARY SCIENCES

DEPARTMENT OF AEROSPACE STUDIES (AIR FORCE ROTC)

Colonel David Sammons, Professor of Aerospace Science

Instructors: Colonel David Sammons, Major Lisa Coleman, Major Donald Land, Captain Seth Hamilton

AFROTC Program

AFROTC has a very active component (over 40%) of students participating in and evaluating the prospect of becoming an Air Force Officer during a period of "non-obligated" class attendance. These first two years in the AFROTC program are called the General Military Course (GMC). Although students can enter the program throughout their freshman and sophomore year, the two primary means that lead to a commission in the United States Air Force (USAF) are the four-year and compressed programs.

The four-year program allows freshmen to enroll in Aerospace Studies courses in the same manner as other college courses for the first two years. Students take these courses as free electives and incur no military obligation unless they are receiving an AFROTC scholarship.

The compressed program is available to those who do not take the first two years of Air Force ROTC. Interested students must contact the Professor of Aerospace Studies early in the first semester of their sophomore year. Accepted students will attend a five-week (versus the standard four-week) summer field training encampment. The last two years of AFROTC comprise the Professional Officer Course (POC).

Students at every level have numerous opportunities to further their knowledge of the Air Force, as well as their leadership. A variety of programs during the summer allow freshmen to visit bases or participate in programs such as the US Air Force Academy Free Fall program, manned glider training, combat survival, and numerous other activities. POC students have similar opportunities, focusing primarily, however, on programs related to the cadet's desired active duty career area, both in the U.S. and abroad. Throughout the school year, cadets have opportunities to examine all aspects of life in the Air Force and gain leadership experience through Air Force base visits, flying opportunities, and social activities.

Upon graduation and satisfactory completion of the POC, the student is commissioned a second lieutenant in the USAF and is obligated to serve a minimum of four years on active duty.

All students who complete the academic program of study with a minimum of 15 hours in military studies are eligible to receive a Military Studies minor.

Financial Aid

Students enrolled in the program are encouraged to apply for Air Force ROTC scholarships. Scholarships pay for tuition, fees, books, and provide students a stipend each month during the academic year for miscellaneous expenses. Stipends vary according to the student's year of academic enrollment in AFROTC. For example, freshmen currently receive $250 per month, sophomores $300 per month, juniors $350 per month, and seniors $400 per month. Scholarships are awarded by the Air Force based primarily on college academic achievement. All scholarships have minimum academic standards that must be maintained. Students in the GMC, other than scholarship students, receive no monetary allowance. Special scholarships are awarded to fill critically needed academic majors within the Air Force. Currently, the Electrical Engineering, Computer Engineering, and Environmental Engineering students who meet minimum grade point average and physical standards qualify for these scholarships.

Curriculum

The AFROTC educational program provides professional preparation for future Air Force officers. Courses in the first two years (GMC) focus on Air Force missions and organization, other military services, and the history of airpower. The focus in the last two years (POC) is on leadership and management and in-depth examination of national security, American defense strategy, and the methods for managing conflict. A progressive development of communicative skills, oral and written, is integrated into each course. Officership is developed through lessons taught in the classroom environment and then applied in the associated leadership laboratory. In addition, traditional military social functions, base orientation trips, and cadet-centered programs further enhance student understanding of the USAF.

Eligibility

All full-time freshmen and sophomores may enroll in the GMC without obligation to the Air Force through enrollment in the AS 100 and AS 200 blocks of Aerospace Studies curriculum. To enter the POC, students must pass an Air Force Officer Qualifications Test, meet physical and academic requirements, and be selected by the Professor of Aerospace Studies and Air Force ROTC headquarters. In addition, some age restrictions apply; contact the department for more details. Students desiring to enter the four-year program simply register for the freshmen Aerospace Studies course. All students should contact the ROTC office on campus in room 133 Reynolds Coliseum, (919) 515-2417; or write to: Professor of Aerospace Studies, NC State, Box 7308, Raleigh, NC 27695-7308.

Organization

The AFROTC Corps, nicknamed "Wolfpack Warriors," is organized as a cadet wing staffed entirely by cadets for leadership development. They are assisted and advised by the instructors. Two collateral organizations, Arnold Air Society and Honor Guard, support the wing organization as well as the university.

Uniforms

Uniforms are provided by the federal government and are worn on the day of Class Leadership Laboratory or as specified by the cadet corp leadership.

View the NC State Air Force ROTC website at the following address: www.ncsu.edu/airforce_rotc.

DEPARTMENT OF MILITARY SCIENCE (ARMY ROTC)

Lieutenant Colonel Carol Ann Redfield, Professor of Military (PMS)

Instructors: Major Bill Medley, Captain Matthew Devivo, Master Sergeant Andre Harris, Sergeant First Class Julio Nazario

Mission

The mission of the Army ROTC Program is to train college men and women to become commissioned officers in sufficient numbers to meet Active Army, Army Reserve and National Guard requirements.

Program of Instruction

The Army ROTC program consists of a voluntary Basic Course (freshmen and sophomore level) and a two-year Advanced Course (junior and senior level) that includes a six-week Leadership Development Assessment Course in the summer prior to the senior year. One may enter the Advanced Course without participating in the Basic Course by any of the following methods:

Simultaneous Membership Program (SMP): Members of Reserve or National Guard units may take advantage of this program and, if accepted, enroll directly into the Advanced Course. SMP participants will be assigned to a unit near NC State or home for part-time monthly officer training and will receive the ROTC Advanced Course subsistence payment of $450 per month for Juniors and $500 for Seniors, plus approximately $200 per month for the one weekend of Reserve or Guard training. In addition, two weeks of Annual Training will be required for which the individual will receive full pay.

Prior Service: Service veterans are eligible for placement into the Advanced Course.

Leader's Training Course (LTC): Successful completion of the four-week basic summer camp, held at Ft. Knox, Kentucky is an alternative to the Basic Course. Students with strong academic credentials may receive a scholarship after completing this course.

Transfer Credit: Students entering as transfer students from other institutions may receive credit for work completed at other Senior ROTC units.

Junior ROTC: Students who have participated in a Junior ROTC in high school may receive placement credit as determined by the Professor of Military Science.

Eligibility

All full-time freshmen and sophomores may enroll in any Military Science Basic Course offering without obligation to the Army. To be eligible for participation in the Advanced Course, applicants must be in good academic standing and demonstrate satisfactory performance in the Basic Course. Additionally, applicants for commissioning must be able to be commissioned by their 30th birthday. An age waiver may be obtained as long as the individual will be commissioned prior to his/her 32nd birthday. A student must have a minimum of two years remaining as a full-time student at either the undergraduate or graduate level.

Professional Military Education

There are five Professional Military Education (PME) courses which must be taken or have an approval of a waiver obtained for them. All but one content area (Military History) are automatically met by completion of the university's General Education Distribution Requirements. PME requirements must be completed or waived prior to commissioning.

Delays for Graduate Study

Qualified ROTC graduates may delay their entry into active service in order to obtain advanced academic degrees. Fellowships for advanced academic study are available to selected ROTC graduates, allowing up to two years of graduate study while receiving full pay and allowances plus payment for tuition, all fees, textbooks, and required supplies.

Financial Aid

Army scholarships of two to four years which pay for tuition, all fees and textbooks are available on a competitive basis to students who are strongly motivated and academically qualified. Students in the Advanced Course who are preparing for commissioning

receive a subsistence allowance of $450 per month for Juniors and $500 per month (tax free) up to a maximum of $4500. All Advanced Course cadets are paid approximately one-half the basic pay of a second lieutenant while attending the six-week Advanced Camp, plus travel allowances to and from camp.

Service Opportunities

Scholarship recipients may serve four years active duty upon commissioning or eight years in the United States Army Reserve or National Guard. Service consists of one weekend drill per month and two weeks annual training.

Program Features

Army ROTC classes are unique, offering instruction and a practical, working knowledge of leadership. Students are challenged early in the ROTC training to enable them to develop sound judgment, the desire to achieve, acceptance of responsibility, personal confidence, and to learn the principles of personnel management. The primary vehicle for this training during the academic year is Leadership Laboratory, where cadet officers and non-commissioned officers conduct instruction under the supervision of the Department of Military Science's faculty. The intensive summer Leadership Development Assessment Course is extremely effective in developing an individual emotionally, mentally and physically. All Army ROTC training is focused on preparing the student to meet the challenges of tomorrow's society, whether in a military or civilian career.

Distinguished Military Students

The university names outstanding Army ROTC students as Distinguished Military Graduates.

Uniforms

Uniforms for ROTC are provided by the federal government.

Departmental Offices

Our Administrative Office is located in Room 145 Reynolds Coliseum.

DEPARTMENT OF NAVAL SCIENCE (NAVAL ROTC)

Captain Stephen Matts, Professor of Naval Science

Associate Professor: Lt. Col. Timothy Nichols; Instructors: Lt. Daniel Kuckel, Lt. Nathan Hall, Lt. James Reynolds, Lt. Jacob Joubert, Capt. Todd Gillingham USMC

Mission

The purpose of the Department of Naval Science is to develop midshipmen and enlisted "officer candidates" mentally, morally, and physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to commission college graduates as Navy and Marine officers who possess a basic professional background, are motivated toward careers in the naval services, and have a potential for future development in mind and character so as to assume the highest responsibilities of command, citizenship, and government.

4-year NROTC Program

There are basically two NROTC programs leading to a commission as a Navy or Marine Officer upon graduation: the Scholarship Program and the College Program.

Scholarship Program: The Scholarship Program leads to a commission in the Navy or Marine Corps. For students who receive a Navy/Marine Corps scholarship, the Navy will pay tuition and fees, provide a $375 book allowance each semester, supply uniforms, and pay a monthly tax-free subsistence allowance (currently $250 to $400 on a graduated scale; refer to https://www.nrotc.navy.mil for updates), to help defray the cost of normal board at the university. During the summers between school years scholarship students will receive 4-6 weeks of at-sea training conducted on ships, submarines, and aircraft of the Navy's first line force. Upon graduation and commissioning, scholarship students are obligated to serve a minimum of four years on active duty.

College Program: For those students who are interested in a commission and do not desire a scholarship, or for those who are seeking an opportunity to qualify for a scholarship after entering NC State, the College Program is available. Selection for the College Program is made from students already enrolled at NC State, with applications being accepted and considered by the staff of the NROTC unit. Students enrolled in the College Program are provided uniforms and Naval Science textbooks. College Program students compete for selection to continue NROTC in Advanced Standing at the end of their sophomore year. Selection is based on academic and demonstrated professional performance. Those selected for Advanced Standing receive a monthly subsistence allowance during the final two years of the program (refer to https://www.nrotc.navy.mil for amounts). College Program midshipmen receive a single summer training cruise between the junior and senior year. Except for administrative differences, no distinction is made between the Scholarship and College Program midshipmen. The minimum active duty commitment following graduation for a College Program Student is three years.

Students in the College Program are eligible to compete for scholarships at regular intervals. Most College Program students who have demonstrated average academic and professional performance in the unit have received scholarships.

Two-Year Programs

The Two-Year Programs offer an opportunity to participate in NROTC in the final two years of University study. Both Scholarship and College Programs exist, offering the same advantages to the student having two years of college remaining as the respective four-year programs.

Applications for this program must be completed by March 15 prior to the starting year. Upon selection, the candidate attends a six-week training course at Newport, Rhode Island, during the summer between the sophomore and junior years so that he or she may receive instruction in the Naval Science subjects normally covered in the first two years at the university. Participants in this training course receive uniforms, room and board, and officer candidate pay during the period and, upon satisfactory completion of training, enter the NROTC program as third year students. The application process can be time consuming. In order to meet the March 15 deadline, students are encouraged to contact the Department of Naval Science before December 1 of their sophomore year.

The Marine Option

A limited number of quotas are available for students who wish to enter either of NROTC programs as designated Marine Officer candidates. Undesignated midshipmen who wish to pursue a Marine Corps commission are encouraged to make this selection during their sophomore year, as some modifications to the curriculum and the final summer training period may result. Change of option selection boards are held on a biannual basis. Those interested or contemplating a commission in the Marine Corps should contact the Marine Officer Instructor.

Curriculum

Due to the increasingly advanced technologies being employed by the Navy and Marine Corps, candidates for Navy Commissions are encouraged to select academic majors in mathematics, engineering, or scientific disciplines. However, each student in the NROTC program is free to choose his or her area of major study.

The NROTC training program emphasizes academics, leadership, military organization, and physical fitness. Required Naval Science courses are fully accredited, taken for free elective credit and include Introduction to Naval Science, Naval History, Leadership and Management, Navigation, Naval Engineering, Naval Weapons Systems, Naval Operations, and Leadership Ethics. Marine Option midshipmen substitute Evolution of Warfare and Amphibious Warfare for selected courses. Additional University courses may be required depending upon one's major, however, all Navy option scholarship midshipmen must complete one year of calculus and physics. In addition to the courses taken for University credit, midshipmen will attend leadership laboratory and physical training each week. At the completion of the four-year period students will have earned enough credit to apply for a minor in Naval Science.

Midshipmen Life

Academic excellence is emphasized and commensurate participation in the full range of campus extra curricular activities is encouraged. The NROTC unit is organized as a midshipmen battalion to facilitate leadership development. The battalion is staffed entirely by midshipmen under the supervision of staff instructors. Additionally, midshipmen have opportunities to examine all aspects of life in the Navy and Marine Corps and gain leadership experience through field trips, summer cruise, sail training, and social activities. Further information regarding application for and admission into the NC State Naval ROTC may be obtained on campus in Room 186 Reynolds Coliseum or by writing to the Professor of Naval Science, Box 7310, NC State, Raleigh, North Carolina 27695-7310 or by calling Mr. Jimmy Ledbetter at (919) 515-2757.

The Department of Military Science (Army ROTC), the Department of Aerospace Studies (Air Force ROTC), and the Department of Naval Science (Naval ROTC) are separate academic and administrative subdivisions of the institution. Students in the ROTC programs will receive free elective credit for Aerospace Studies (AS), Military Studies (MS), or Naval Science (NS) courses up to the limit of free electives in their curriculum.

RESEARCH CENTERS AND FACILITIES

Research Triangle Park

NC State is one of the three Triangle area top-tier research universities along with Duke University in Durham and the University of North Carolina at Chapel Hill. Within the 30 mile triangle formed by the three universities is The Research Triangle Park, a 7,000-acre research park founded in 1959 by leaders from academia, business and government. Today, The Research Triangle Park is home to some of the most innovative and cutting-edge research based companies in the world.

The unique "Research Triangle" area of North Carolina has captured national and international attention. The "triangle" is formed by the three geographic points of Raleigh, Durham and Chapel Hill that are home to the area's top-tier research universities: NC State, Duke University and University of North Carolina at Chapel Hill. Because of this wealth of educational and research opportunities, the triangle contains one of the highest total of Ph.D. scientists and engineers per capita, in the nation. The highly educated workforce in the Triangle is extremely attractive to companies, many of which engage in collaborative programs within the area universities.

Since it was established, The Research Triangle Park has witnessed a steady and stable increase in the number of companies and employees. Currently, there are 157 organizations in the RTP community. More than 39,000 people work in the Park, with combined annual salaries of over $2.7 billion. Organizations in the Park include government research laboratories of the National Institute of Environmental Health Sciences, and the U.S. Environmental Protection Agency. Private companies such as IBM, GlaxoSmithKline, Nortel Networks, and Cisco Systems are located in the park. Faculty and companies like GlaxoSmithKline, IBM, and BD Technologies frequently hold adjunct appointments in one or another of the Triangle universities.

The Analytical Instrumentation Facility (AIF)

D.P. Griffis, Director, Analytical Instrumentation Facility

The Analytical Instrumentation Facility (AIF) provides NC State faculty and students with the highest level of modern microanalysis instrumentation currently available as well as trained specialists to assist with teaching, training, instrument operation, and experimental design. The unique combination of extensive analytical instrumentation and specialized staff make AIF a valuable asset to both teaching and research at all levels. AIF staff provides the expertise to access AIF's state of the art analytical capabilities, conduct training and provide guidance to students. AIF is located in the Larry K. Monteith Engineering Research Center on the NC State Centennial Campus. This laboratory space, located in the mixed-use (private industry/academics) environment of Centennial Campus, provides the optimum environment for teaching, research and technology transfer. AIF analytical capabilities encompass analyses of materials including ceramics, metals, semiconductors, polymers, and biological materials. The Variable Pressure Scanning Electron Microscope (VPSEM), which can operate at high chamber pressure for charge neutralization, gives AIF the capability of providing electron microscopy and EDS (Energy Dispersive X-Ray Spectroscopy) elemental analysis on uncoated non conductive samples including biological, polymeric, textile, and other materials. The VPSEM facility is used extensively by undergraduate students in a wide range of disciplines. AIF has extensive capabilities in the areas of Atomic Force Microscopy (AFM) for high resolution surface topography measurement, Field Emission Scanning Electron Microscopy (FESEM) for high resolution imaging, dynamic Secondary Ion Mass Spectrometry (SIMS) for trace analysis, Time of Flight SIMS for molecular surface analysis, X-Ray Photoelectron Spectrometry (XPS) for chemical surface analysis, and a metallography laboratory. In addition, AIF has extensive facilities for specimen preparation for all of the above mentioned analytical techniques.

Animal and Poultry Waste Management Center

C. M. Williams, Director
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Raleigh, NC 27695-7608

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The Animal and Poultry Waste Management Center coordinates collaborative research, education, and extension iniatives among universities, agribusiness and other organizations to address waste management concerns. Collaborating universities have included Georgia, Iowa State, Kentucky, Michigan State, Mississippi State, Ohio State, Oklahoma State, and Virginia Polytechnic Institute, and others. Agribusiness environmental groups and regulatory agencies serve the center in an advisory role. Center-sponsored projects include technology applications targeting environmental emissions from livestock operations, and the improvement of air and water quality associated with animal waste management. Other center work includes energy recovery from animal by-products and providing facilities and equipment for carrying out research and teaching activities focusing on converting animal by-products into economically feasible and socially acceptable value-added products.

Center for Advanced Computing and Communication

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website: www.ece.ncsu.edu/cacc

The Center for Advanced Computing and Communication (CACC) is a National Science Foundation (NSF) sponsored Industry/University Cooperative Research Center with its research site at NC State University. An advisory board comprised of representatives of member companies and government agencies meets twice a year to direct the center's research activities. Faculty and graduate students work closely with the members on a variety of research projects. Current members include Cisco Systems, Ericsson, IBM, Qimonda, MCNC, National Security Agency, Nortel Networks, and Tekelec.

The center's mission is to carry out basic and applied research on problems having both industrial and academic relevance, to transfer these results to our members, and to provide our students with a challenging educational opportunity. Our research goal is to create concepts, methods, and tools for use in the analysis, design, and implementation of advanced computer and communication systems.

Center for Advanced Electronic Materials Processing (AEMP)

C. M. Osburn, Director

The Center for Advanced Electronic Materials Processing was established in 1988 as a National Science Foundation Engineering Research Center. More, recently, it has included the SRC/SEMATECH Research Center program on Front End Processes for advanced semiconductor devices in collaboration with a large number of other universities. The center's program is interdisciplinary involving collaboration among chemists, physicists, materials scientists and electrical, chemical and mechanical engineers. The research focuses on the development of processing technologies capable of producing nanometer scale electronic devices. The center is responsible for the operation of the NCSU Nanofabrication Facility and the Triangle National Lithography Center - an affiliate of the National Nanotechnology Infrastructure Network. These cleanroom facilities are open to students, faculty, and world-wide researchers to fabricate and test nanostructures. Undergraduate Scholar Awards are available for qualified undergraduates with interest in electronic materials and devices.

Center for Advanced Processing and Packaging Studies

K. P. Sandeep, Site Director

The Center for Advanced Processing and Packaging Studies was established in October 1987 to promote cooperative research between university and industrial researchers and to further scientific knowledge in areas of food and pharmaceutical aseptic processing and packaging. The mission and focus of the center is to conduct industrially relevant research directed at developing methods and technologies for the safe production of marketable, high quality aseptic and refrigerated extended shelf-life products. The center is funded by industrial members from the food, processing and packaging industries and receives support from the National Science Foundation and the universities involved. Students working on CAPPS projects will be exposed to industrial concerns and be given the opportunity to work first-hand with industry in solving problems and making practical application of their research. Cooperative research opportunities are available in the Department of Food Science at NC State and also at other universities.

Center for Chemical Toxicology Research and Pharmacokinetics

J. E. Riviere, Director

The Center for Chemical Toxicology Research and Pharmacokinetics performs scientific research on cutaneous function and structure focused on cutaneous toxicology, metabolism and pharmacokinetics and transdermal drug delivery, employing innovative animal and mathematical models and other predictive systems including cell cultures and novel analytical techniques. Current research is focused on the absorption of chemical mixtures and the toxicology of nanomaterials. This provides the necessary research base to support a rigorous graduate and post-graduate training program in comparative pharmacology and toxicology designed to produce health scientists for academia, industry and government. Besides laboratory research, CCTRP also operates the US and global Food Animal Residue Avoidance Databank (FARAD), performs the residue avoidance data analysis, and provides assistance to those who have questions about how to prevent residues in animal-derived food.

Additional resources: FARAD - Food Animal Residue Avoidance Databank, 1-800-USFARAD, www.farad.org.

Center for Engineering Applications of Radioisotopes

Robin P. Gardner, Director

The Center for Engineering Applications of Radioisotopes was established in 1980 within the Department of Nuclear Engineering and associated with the Department of Chemical Engineering. It is composed primarily of faculty and their graduate students and post-doctoral students doing research related to the measurement applications of radiation and radioisotopes in industry. This includes the use of short-lived radioactive tracers, radiation gauges, radiation analyzers, and computed tomography. CEAR has devoted much effort to the development and use of Monte Carlo simulation for the design and inverse analysis use of these applications. Excellent experimental facilities are available including solid state and very large NaI detectors and the NC State PULSTAR Nuclear Reactor. The center's programs are financed largely by an Associates Program for oil well logging and grants from industry and federal agencies such as NIH and DOE.

Center for Research in Mathematics and Science Education

S. B. Berenson, Director — sarah_berenson@ncsu.edu
Glenda S. Carter, Associate Director — glenda_carter@ncsu.edu

The only research-focused center in the North Carolina Mathematics and Science Education Network conducts research and development activities for precollege students, pre-service teachers, in-service teachers, and University faculty. Established in the Department of Mathematics, Science & Technology Education in 1984, the center identifies needs and forms partnerships with federal, state, local, and private funding agencies to work collaboratively to enhance mathematics and science education. Grants have been obtained from the National Science Foundation, U.S. Office of Education, State Department of Public Instruction, local

education agencies, the Ford Foundation, IBM, and Glaxo-Smith-Klein Foundation to introduce changes that incorporate technology and problem solving into the preK-16 curriculum. The center supports graduate students, providing professional opportunities to write grants and to design, conduct, and report on educational research. website: www.ncsu.edu/crmse.

Center for Research in Scientific Computation

H. T. Banks, Director

The Center for Research in Scientific Computation (CRSC) is a formally recognized, multidisciplinary center of the greater University of North Carolina System. The CRSC is administered by NC State and the College of Physical and Mathematical Sciences. The purpose of the center is to promote research in scientific computing and to provide a focal point for research in computational science, and applied mathematics. Data-massive and/or computationally intensive problems provide ideal projects for training and graduate students in applied mathematics. With advanced computing methodologies students and post doctoral fellows address important issues in applications involving model development and control design.

Research topics of interest to CRSC faculty include a variety of problems in scientific computation, numerical analysis, and numerical optimization with applications to such areas as fluid mechanics and flow control, smart materials and structures, nondestructive testing, acoustics, material sciences and manufacturing processes, population dynamics, environmental sciences, signal processing, computer performance evaluation and nuclear reactor physics.

The CRSC, in cooperation with the Department of Mathematics, sponsors a university/industrial research project program. The main goal of the Industrial Applied Math Program (IAMP) is to provide substantive non-academic research related experiences for graduate students, postdoctoral and faculty participants while contributing to the research efforts of industrial participants.

Center for Transportation and the Environment

Downey Brill, Director

The Center for Transportation and the Environment conducts programs of research, education, and technology transfer that seek to mitigate the impacts of surface transportation on the environment. Funded in part by the U. S. Department of Transportation and the North Carolina DOT, CTE is the only university transportation in the country that pursues ways to improve surface transportation systems while protecting the environment. CTE is considered a national resource for current information about transportation and environmental research, policies, and best practices. The center conducts an innovative and aggressive outreach program, using satellite- and computer-based technologies, to assist transportation and environmental professionals with their most critical information needs. For more information, visit CTE's website at: cte.ncsu.edu.

Electric Power Research Center

P. J. Turinsky, Executive Director

The Electric Power Research Center, established in 1985 within the NC State College of Engineering, is supported via membership fees, enhancement grants, and normal research contracts by organizations from the various sectors of the electric utility and power industry, including national laboratories and private interests. The purpose of the center is to collaborate in enhancing the excellence of a wide range of research and graduate-level degree programs in nuclear power systems. This primary purpose is accomplished by supporting interested faculty and students' involvement in basic and applied research directly relevant to the needs of the multifaceted nuclear power industry. Motivation to work with the center derives from the close university/membership interaction, the leverage afforded members via pooled resources, and the enhanced professional and research opportunities provided to faculty and students in nuclear power engineering.

The current research program involves faculty from the Department of Nuclear Engineering.

Electron Microscope Facilities

There are three electron microscope facilities at NC State available to graduate students and faculty for research purposes. The College of Agriculture and Life Sciences Center for Electron Microscopy is located in Gardner Hall, and the Analytical Instrumentation Facility on Centennial Campus is in the Monteith Engineering Research Center. The College of Veterinary Medicine Laboratory for Advanced Electron and Light Optical Methods (LAELOM) is located at 4700 Hillsborough Street in Raleigh.

The College of Agriculture and Life Sciences Center for Electron Microscopy
J. M. Mackenzie, Jr., Coordinator, CALS Center for Electron Microscopy

The College of Agriculture and Life Sciences Center for Electron Microscopy occupies approximately 300 square feet in the basement of Gardner Hall. It is a centralized facility that services the ultra-structural needs of twenty-two departments. The College of Agriculture and Life Sciences Center for Electron Microscopy offers complete service support in all areas of Biological Electron Microscopy. The Center has a JEOL 5900LV scanning electron microscope, which has low vacuum capabilities and two transmission electron microscopes: a JEOL 100S and a Philips 400T. The Center is equipped with all of the necessary biological, preparatory equipment including a new Cressington Cryo-Fracture, Deep-Etch System.

The Center provides advanced, digital imaging capabilities. We provide access for Macintosh, PC and UNIX based systems allowing transparent information transfer regardless of user's platform preference.

Formal instruction is provided through the Microbiology curriculum for transmission electron microscopy, scanning electron microscopy, ultramicrotomy and digital imaging. The Center also provides support, service, and training in a wide variety of advanced digital imaging. Advanced techniques are usually taught on an individual basis. The Coordinator invites any prospective users to discuss the most effective strategy for completing their imaging project.

The CVM Laboratory for Advanced Electron and Light Optical Methods
M. J. Dykstra, Director, LAELOM

The LAELOM is a full-service facility providing clinical and research support for the CVM as well as the full NC State campus. The LAELOM houses a FEICO/Philips EM208S transmission electron microscope and a JEOL JSM-6360LV low vacuum scanning electron microscope with all the necessary support equipment for tissue preparation as well as extensive darkroom facilities for the production of electron microscopy images. The LAELOM also houses an extensive collection of light microscopy instruments, including an Olympus Vanox motorized compound light microscope that can capture images with film, a 3 CCD video cameral (live images) or a high-end SPOT RT Slider cooled CD camera. Bright field, polarized, and epifluorescence images can be recorded with this microscope. A Wild photomicroscope is also available for viewing and recording images from larger specimens with bright and dark-field optics. A Nikon C-1 confocal scanning laser microscope system with a heated stage coupled to a Nikon Eclipse 2000E motorized inverted photomicroscope is equipped for bright field, polarized, and epifluorescence image capture with a digital camera. For morphometry needs, the program Image-Pro Plus is available.

Institute for Emerging Issues

Anita Brown-Graham, Director

The Institute for Emerging Issues (IEI) is a public policy, think-and-do-tank at NC State University. Through research, ideas, debate and action, IEI is a catalyst for innovative public policy, engaging students, faculty and the private sector in its ongoing programs of work. Encouraging civic leadership in business, government and higher education, IEI frames future challenges for North Carolina by identifying and researching emerging issues, specifically around topics that relate to the state's growth and economic development.

The Institute brings together new combinations of leaders to debate and refine ideas mobilizing and supporting champions through programs of work that turn ideas into action.

To learn more about IEI, please visit www.emergingissues.org or call (919) 515-7741.

Institute of Statistics

Sastry G. Pantula, Director

The Institute of Statistics is comprised of two sections, one at NC State and the other at UNC-Chapel Hill. At NC State, the Institute of Statistics sponsors statistical collaborations within the university and with its partners in industry and government. It also sponsors methodological and theoretical research in the statistical sciences and cross-disciplinary research. The Institute coordinates the teaching of statistics at the undergraduate and graduate levels. Instructional functions and the granting of degrees are performed by the Department of Statistics, which forms a part of the Institute.

Institute for Transportation Research and Education (ITRE)

Nagui M. Rouphail, Ph.D., Director

The Institute for Transportation Research and Education is an inter-institutional center of the University of North Carolina system. Chartered by the North Carolina General assembly in 1978, ITRE conducts research and training for numerous public agencies at the federal, state, and local levels of government and private industry. Additionally, the Institute provides financial and research support for undergraduate and graduate students from various disciplines. The Institute is comprised of several specialty groups including public transportation, highway systems, commercial vehicle and safety, and pupil transportation. The Institute is also the home of the Center for Transportation and the Environment and the North Carolina Local Transportation Assistance Program (LTAP), both federally-funded centers.

Integrated Manufacturing Systems Engineering Institute

T. J. Hodgson, Director

The Integrated Manufacturing Systems Engineering (IMSE) Institute was established in 1984. IMSE provides multidisciplinary graduate-level education and practical training opportunities in the theory and practice of integrated manufacturing systems engineering at the masters level. IMSE focuses on providing a manufacturing presence and a program environment in the College of Engineering where faculty, graduate students and industry can engage cooperatively in multidisciplinary graduate education, basic and applied research, and technology transfer in areas of common interest related to modern manufacturing systems technology. The objective of the IMSE program is to offer students with traditional discipline backgrounds in engineering and the physical sciences an opportunity to broaden their understanding of the multidisciplinary area of manufacturing systems. Core areas of concentration are offered in manufacturing systems, logistics, and mechatronics, and bio and medical device manufacturing.

Nonwovens Cooperative Research Center

B. Pourdeyhimi, Director

The Nonwovens Cooperative Research Center (NCRC) was established in 1991 and has been funded by the National Science Foundation (NSF), the State of North Carolina and industrial membership. The NCRC is located at the College of Textiles on the Centennial Campus. The center serves the nonwovens industry through its programs of generic fundamental and applied research in the technologies of the industry as well as through an active program of technology transfer. The core research programs are centered on product performance, process development and analysis, and materials application/development. The center also pursues non-core research projects sponsored by companies on specific problems on a propriety basis.

The center provides opportunities to gain hands-on experience in nonwovens research to students studying toward various degrees. An undergraduate minor in the science of nonwovens is offered as well as a Graduate Certificate in Nonwovens. A master's degree is possible as an option for the graduate degree in Textile Technology, along with a Ph.D. in Polymer and Fiber Sciences. Faculty members from NC State, Georgia Tech, Clemson University, University of Tennessee, etc., are involved in several research projects funded by NCRC. Over 65 companies are industrial members. This includes the seven top roll goods producers representing over half of all worldwide sales in this area. Industrial members come from many countries including Germany, Turkey, Japan, Korea, and Canada.

Nuclear Reactor Program

Ayman I. Hawari, Director

The mission of the Nuclear Reactor Program is to enhance, promote, and utilize the PULSTAR research reactor and associated laboratory facilities for research, teaching, and extension. Specialized facilities are available to university faculty, students, state and federal agencies, and industry. The laboratory contains the 1 megawatt steady-state, pool-type, PULSTAR nuclear reactor with a variety of associated academic, testing, and research facilities including: Distance Learning through Video and Internet Tele-conferencing; an ultracold neutron source, a neutron radiography facility; an intense slow positron beam facility; a powder neutron diffraction facility; a neutron activation analysis and radioisotope laboratory; a low level counting laboratory equipped with high purity germanium gamma spectrometers and beta liquid-scintillation systems; and a Cobalt-60 gamma irradiation facility.

The 50,000 square-foot Burlington Engineering Laboratory complex on the NC State campus houses the Department of Nuclear Engineering and the 1 MW PULSTAR Nuclear Research Reactor Facility.

Contact: e-mail: kkleong@unity.ncsu.edu; website: www.ne.ncsu.edu/NRP/reactor_program.html; phone: (919) 515-7294

Oak Ridge Associated Universities (ORAU)

NC State has been a sponsoring institution of Oak Ridge Associated Universities (ORAU) since 1949. ORAU is a private, not-for-profit consortium of 96 colleges and universities and a management and operating contractor for the U. S. Department of Energy (DOE) with principle offices located in Oak Ridge, Tennessee. Founded in 1946, ORAU provides and develops capabilities crucial to the nation's technology infrastructure, particularly in energy, education, health, and the environment. ORAU works with and for its member institutions to help faculty and students gain access to federal research facilities; to keep members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among our members in areas where their collective strengths can be focused on issues of national importance.

ORAU's Office of Partnership Development seeks opportunities for partnerships and alliances among ORAU's members, private industry, and major federal facilities. Activities include facility development programs, such as the Ralph E. Powe Junior Faculty Enhancement Awards, the Visiting Industrial Scholars Program, consortium research funding iniatives, faculty research and support programs as well as services to chief research officers (see www.orau.org).

Throughout the Oak Ridge Institute for Science and Education (ORISE), the DOE facility that ORAU operates undergraduates, graduates, postgraduates, as well as faculty enjoy access to a multitude of opportunities for study and research. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science — and engineering-related disciplines. A comprehensive listing of these programs and other opportunities, their disciplines, and details on locations and benefits can be found in the *ORISE Catalog of Education and Training Programs*, which is available at www.orau.gov/orise/educ.htm. Contact Ray Fornes, (919) 515-7865 for more information about ORAU programs or see www.orau.org.

Plant Disease and Insect Clinic

Tom Creswell, Manager
website: www.ncsu.edu/pdic

The Plant Disease and Insect Clinic (PDIC) provides a unique diagnostic and educational service to plant growers in North Carolina. It is an integral part of the extension program in the Departments of Plant Pathology and Entomology. The PDIC receives approximately 3,600 problem samples each year. County Agents, Extension Specialists, consultants and growers submit samples from nurseries, greenhouses, agricultural crops, forests and urban landscapes. This provides an opportunity to observe and work with practical problems currently developing and causing damage.

Changes in agricultural technology and trade patterns influence the range of pest problems encountered and require new types of assays and more sophisticated laboratory examinations. Participation in the National Plant Diagnostic Network assures that new problems discovered in NC will be properly documented in the USDA - NADN database and tracked appropriately to help safeguard agriculture in NC and the US. Plant problems must be correctly diagnosed and proper control strategies employed as quickly as possible for growers to minimize losses. The PDIC provides a vital link between the numerous highly specialized resources and faculty members at NC State and problems as they arise in the field. New or unusual outbreaks of plant diseases and insects can be quickly detected through the PDIC.

Power Semiconductor Research Center

B. J. Baliga, Director

The Power Semiconductor Research Center was established as an industrial consortium at NC State University on July 1, 1991. It has garnered support from around the world with more than a dozen companies participating in the venture. The mission of the center is to perform fundamental studies on semiconductor technology for power electronics applications. Although many centers have been established in the past for performing research in the area of microelectronics, PSRC was the first center to focus the research towards power electronics applications. The power electronics that will benefit from this research have widespread utility in society. These applications are computer power supplies and automotive electronics at relatively low operating voltages (50 to 100 volts); displays, telecommunications, appliance controls, and motor drives at medium operating voltages (300 to 1,500 volts); and traction (electric trains), and power transmission systems at high operating voltages (2,000 to 10,000 volts). Power semiconductor devices determine the pace for technological advancements in power systems because of the continuing trend to reduce size and weight and to improve the efficiency. This has important social implications in terms of conservation of fossil fuels and reduction of environmental pollution.

The applications require three basic components: (1) three terminal power switches, (2) power rectifiers, and (3) power/high voltage integrated circuits. The research program at PSRC was structured with the goal of developing improved power semiconductor chips in all of these three categories from a short and long term perspective. The following research thrust areas have been worked on since the inception of the center: (a) Power rectifiers, (b) Power MOS-Gated Thyristors, (c) Large Area Power MOS Technology, (d) licensed Isolated Devices for Power Integrated Circuits, (e) Silicon Carbide Technology for Power Devices, and (f) Cryogenic Operation of Power Devices. Although the research is directed toward the development of generic, pre-competitive technology, care has been taken to maintain strong industrial relevance. Silicon devices have been developed which allow 2 to 20 fold improvement in performance for low voltage applications. This technology has already been licensed for product introduction. Theoretically projected performance of silicon carbide high voltage devices has been confirmed experimentally. This technology is expected to play an important role in the 21st century. The research has been documented and shared with the sponsors in the form of 45 patents and 259 technical reports provided to them over the last 10 years of operation. Due to the strong support of the international industrial community, this center is now recognized as the premier research organization for power semiconductor technology in the world. More details can be found at www.psrc.ncsu.edu

Precision Engineering Center

Thomas A. Dow, Director
website: www.pec.ncsu.edu

The Precision Engineering Center, established in 1982, is a multidisciplinary research and graduate engineering program dedicated to providing new technology for high precision manufacturing. Research activity in the PEC involves measurement and fabrication of optical, biological, electronic, or mechanical devices where the tolerances required for operation are on the order of 1 part in 100,000; that is, for a 25 mm (1 inch) long part the error must be less than 250 nm (250 x 10-9m). Components that require this technology include contact lenses and other optical components, hard disk heads for computer memory devices, integrated circuits, space telescopes, injection molding dies, bearings and gears. Current projects in the center involve development of new mechanical designs and control algorithms, novel actuators that include piezoelectric or magnetic drivers, unique fabrication and measurement techniques and high-speed controllers to implement these concepts. With support from government and industry, the PEC pulls together faculty, staff, and students from across the university to develop new ideas and transfer those ideas to US industry.

Sea Grant College Program

Michael P. Voiland, Executive Director

The North Carolina Sea Grant College Program is a state/federal partnership program involving all campuses of the UNC system. Headquartered at NC State, NC Sea Grant also has regional extension offices in three NC coastal communities. Sea Grant combines the universities' expertise in research, extension and education to focus on practical solutions to coastal problems. Graduate and undergraduate research opportunities are available through Sea Grant funded faculty researchers and through two North Carolina fellowships and two national fellowship programs.

Southeastern Plant Environment Laboratory— Phytotron

J. F. Thomas, Director

The Southeastern Plant Laboratory, commonly called the phytotron, is a facility especially designed for research dealing with the response of biological organisms to their environment. The high degree of control within 60 growth chambers makes it possible to duplicate any climate from tropical rain forests to arid desert.

The NC State phytotron concentrates on applied and basic research related to agricultural problems encountered in the southeastern United States. The ability to control all phases of the environment, however, allows inclusion of research dealing with all aspects of plant science. The facilities are available to the resident research staff, participants in NC State's graduate research program, and to foreign visiting scientists.

Triangle Universities Laboratory

Werner Tornow, Director

TUNL is a laboratory for nuclear physics research, funded by the US Department of Energy. Located on the campus of Duke University in Durham, the laboratory is staffed by faculty members and students from Duke University, UNC-Chapel Hill, and NC State. There is extensive collaboration between the participating universities and with visiting physicists from the United States and abroad. The accelerators are a 15-MeV tandem Van de Graaff accelerator and low-energy accelerators dedicated specifically to nuclear astrophysics studies. The newest addition to the TUNL accelerators is the High-Intensity Gamma-ray Source (HIGS) at the Duke Free-Electron Laser Laboratory. Polarized and pulsed beams are available as well as cryogenically polarized targets. In addition, TUNL physicists perform experiments at major national and international nuclear physics facilities.

Water Resources Research Institute

David H. Moreau, Director
website: www.ncsu.edu/wrri

The Water Resources Research Institute is a unit of the University of North Carolina System and is located on the campus of NC State. It is one of 54 state water institutes that were authorized by the Water Resources Research Act of 1964 to identify the state's ever-changing research needs, to motivate and support research by qualified scientists, and to provide for technology transfer. The Institute identifies needed research by tracking water issues and by seeking input from an Advisory Committee representing state and federal agencies, industry, agriculture, local government, and the public large. WRRI publishes technical reports on completed research projects and arranges for technology transfer from researchers to state agency personnel and others who can put the research results to work. The Institute helps keep the public informed about water issues and research results by publishing the *WRRI News* newsletter, an annual program and maintaining a website. WRRI also informs and educates water resources professionals, researchers, and undergraduate and graduate students through electronic lists, seminars, workshops, and conferences.

UNIVERSITY OF NORTH CAROLINA SYSTEM

History of the University of North Carolina

In North Carolina, all the public educational institutions that grant baccalaureate degrees are part of the University of North Carolina. The University of North Carolina is composed of the 16 constituent institutions which form the multi-campus state university.

The University of North Carolina, chartered by the N.C. General Assembly in 1789, was the first public university in the United States to open its doors and the only one to graduate students in the eighteenth century. The first class was admitted in Chapel Hill in 1795. For the next 136 years, the only campus of the University of North Carolina was at Chapel Hill.

In 1877, the N.C. General Assembly began sponsoring additional institutions of higher education, diverse in origin and purpose. Five were historically black institutions, and another was founded to educate American Indians. Several were created to prepare teachers for the public schools. Others had a technological emphasis. One is a training school for performing artists.

In 1931, the N.C. General Assembly redefined the University of North Carolina to include three state-supported institutions: The campus at Chapel Hill (now the University of North Carolina at Chapel Hill), North Carolina State College (now North Carolina State University at Raleigh), and Woman's College (now the University of North Carolina at Greensboro). The new multi-campus University operated with one board of trustees and one president. By 1969, three additional campuses had joined the University through legislative action: the University of North Carolina at Charlotte, the University of North Carolina at Asheville, and the University of North Carolina at Wilmington.

In 1971, the General Assembly passed legislation bringing into the University of North Carolina the state's ten remaining public senior institutions, each of which had until then been legally separate: Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, the North Carolina School of the Arts, Pembroke State University, Western Carolina University, and Winston-Salem State University. This action created the current 16-campus University. (In 1985, the North Carolina School of Science and Mathematics, a residential high school for gifted students, was declared an affiliated school of the University.)

The UNC-Board of Governors is the policy-making body legally charged with "the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." It elects the president, who administers the University. The 32 voting members of the Board of Governors are elected by the General Assembly for four-year terms. Former board chairmen and board members who are former governors of North Carolina may continue to serve limited periods as non-voting members emeriti. The president of the UNC Association of Student Governments, or that student's designee, is also a non-voting member.

Each of the 16 constituent institutions is headed by a chancellor, who is chosen by the Board of Governors on the president's nomination and is responsible to the president. Each institution has a board of trustees, consisting of eight members elected by the Board of Governors, four appointed by the governor, and the president of the student body, who serves ex-officio. (The NC School of the Arts has two additional ex-officio members.) Each board of trustees holds extensive powers over academic and other operations of its institution on delegation from the Board of Governors.

Equality of Opportunity: The University of North Carolina and all of its constituent institutions are committed to equality of opportunity. There shall be no discrimination within the University against applicants, students, or employees on the basis of race, color, religion, sex, age, handicap, or national origin, consistent with the provisions of applicable state and federal law.

Promoting Racial Integration: The University of North Carolina actively seeks to promote racial integration at each of its constituent institutions.

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POLICY ON ILLEGAL DRUGS

The following policy on illegal drugs was adopted by the North Carolina State University Board of Trustees April 16, 1988 - Last Revised, April 16, 1999.

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/campus_environ/health_safety_welfare/POL04.20.5.php

1. Purpose

1.1 Reflecting its concern over the threat which illegal drugs constitute to higher education communities, the Board of Governors of the University of North Carolina adopted a policy on illegal drugs on January 15, 1988. The Board of Governors' policy requires each constituent institution's Board of Trustees to develop a policy on illegal drugs applicable to all students, faculty members, administrators, and other employees. The policy for each campus must address particular circumstances and needs while being fully consistent with specified minimum requirements for enforcement and penalties.

1.2 To assist North Carolina State University in its continuing efforts to meet the threat of illegal drugs, and to comply with the Board of Governors' policy, the Board of Trustees adopts the policy set forth below. This policy is intended to demonstrate the University's primary commitment to education, counseling, rehabilitation, and elimination of illegal drugs, as well as its determination to impose penalties in the event of violation of state and federal drug laws consistent with due process.

2. Education, Counseling, and Rehabilitation

2.1 North Carolina State University shall maintain a program of education designed to help all members of the University community avoid involvement with illegal drugs. The educational program shall emphasize the incompatibility of the use of distribution of illegal drugs with the goals of the University, the legal consequences of involvement with illegal drugs, the medical and psychological implications of the use of illegal drugs, and the ways in which illegal drugs jeopardize an individual's present accomplishments and future opportunities. Specific elements of the education program are:

2.1.1 Publicizing the University's policy in the Student Code of Conduct, the undergraduate and graduate catalogs, and other publications distributed to students, faculty, administrators, and other employees.

2.1.2 Continuing and expanding the drug education program conducted by Student Health Services

2.1.3 Continuing development of courses on drug education

2.1.4 Continuing the drug education component of the employees' Wellness Program

2.1.5 Increasing the awareness and utilization of the University's Employee Assistance Program (EAP)

2.2 The University shall disseminate information about drug counseling and rehabilitation services that are available to members of the University community. Persons who voluntarily avail themselves of such services shall be assured that applicable professional standards of confidentiality will be observed and that such participation will not be the basis for disciplinary action. Specific counseling and rehabilitation efforts include:

2.2.1 continuing the evaluation and referral services of the Counseling Center for out-patient and in-patient rehabilitation;

2.2.2 continuing the consolation and evaluation portions of the Student Health Service's drug education program

2.2.3 utilizing the Employee Assistance Program's referral to existing community-based counseling and rehabilitation services.

3. Enforcement and Penalties

3.1 Students, faculty members, administrators, and other employees are responsible, as citizens, for knowing about and complying with the provisions of North Carolina law that make it a crime to possess, sell, deliver, or manufacture those drugs designated collectively as "controlled substances" in Article 5 of Chapter 90 of the North Carolina General Statutes. The University will initiate its own disciplinary proceeding against a student, faculty member, administrator, or other employee when the offense is deemed to affect the interests of the University. Penalties will be imposed by the University in accordance with procedural safeguards applicable to disciplinary actions against students, faculty members, administrators, and other employees, as required by Section 503D(3) and Section 603 of the University Code, by Board of Governors' policies applicable to other employees exempt from the State Personnel Act and by regulation of the State Personnel Commission. The penalties to be imposed by the University may range from written warnings with probationary status to expulsions from enrollment and discharges from employment. However, the following minimum penalties, as prescribed by the Board of Governors, shall be imposed for the particular offenses described.

3.2 Trafficking in Illegal Drugs

3.2.1 For the illegal manufacture, sale, or delivery, or possession with intent to manufacture, sell, or deliver, of any controlled substance identified in Schedule 1, N.C. General Statutes 90-89, or Schedule 11, N.C. General Statues 90-90 (including, but not limited to: heroin, mescaline, lysergic acid diethylamide, opium, cocaine, amphetamine, methaqualine), any student shall be expelled and any faculty member, administrator, or other employee shall be discharged.

3.2.2 For a first offense involving the illegal manufacture, sale, or deliver, or possession with intent to manufacture, sell, or deliver, of any controlled substance identified in Schedules III through VI, N.C. General Statutes 90-91 through 90-94 (including, but not limited to, marijuana, phenobarbital, codeine), the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent. (Employees subject to the State Personnel Act are governed by regulations of the State Personnel Commission. Because the minimum penalty specified in this section and required by the Board of Governors exceeds the maximum period of suspension without pay that is permitted by the State Personnel Commission regulations, the penalty for a first offense for employees subject to the State Personnel Act is discharge. For a second offense, any student shall be expelled and any faculty member, administrator, or other employee shall be discharged.

3.2.3 For a second of other subsequent offenses involving the illegal possession of controlled substances, progressively more severe penalties shall be imposed, including expulsion of students and discharge of faculty members, administrators, or other employees.

3.3 Illegal Possession of Drugs

3.3.1 For a first offense involving the illegal possession of any controlled substance identified in Schedules III through IV, N.C. General Statutes 90-89, or Schedule II, N.C. General Statutes through 90-90, the minimum penalty shall be suspension from enrollment or from employment for a period of at least one semester or its equivalent (Employees subject to the State Personnel Act are governed by regulations of the State Personnel Commission. Because the minimum penalty specified in this section and required by the Board of Governors exceeds the maximum period of suspension without pay that is permitted by the State Personnel Commission regulations, the penalty for a first offense for employees subject to the State Personnel Act is discharge.)

3.3.2 For a first offense involving the illegal possession of any controlled substance identified in Schedules III through VI, N.C. General Statues 90-91 through 90-94, the minimum penalty shall be probation, for a period to be determined on a case-by-case basis. A person on probation must agree to participate in a drug education and counseling program, consent to regular drug testing, and accept such other conditions and restrictions, including a program of community service, as the Chancellor or the Chancellor's designee deems appropriate. Refusal or failure to abide by the terms of probation shall result in suspension from enrollment or from employment for any unexpired balance of the prescribed period of probation.

3.3.3 For a second or other subsequent offenses involving the illegal possession of controlled substances, progressively more severe penalties shall be imposed, including expulsion of students and faculty members, administrators, or other employees.

3.4 Suspension Pending Final Disposition

When a student, faculty member, administrator, or other employee has been charged by the University with a violation of policies concerning illegal drugs, he or she may be suspended form enrollment or employment before initiation or completion of regular disciplinary proceedings if, assuming the truth of the charges, the Chancellor or, in the Chancellor's absence, the Chancellors's designee concludes that the person's continued presence within the University community would constitute a clear and immediate danger to the health or welfare of other members of the University community; provided, a hearing on the charges against the suspended person shall be held as promptly as possible thereafter.

4. Coordinator of Drug Education

The Associate Vice Chancellor for Human Resources and the Director of Student Judicial Programs will serve as the coordinators of drug education for employees (faculty and staff) and students respectively. Acting under the authority of the Chancellor, each will be responsible for overseeing all actions and programs relating to this institutional policy in their respective areas.

5. Reporting

Annually the Chancellor shall submit to the Board of Trustees a report on campus activities related to illegal drugs for the preceding year. The report shall include, as a minimum, the following: (1) a listing of the major education activities conducted during the year; (2) a report on any illegal drug-related incidents, including any sanctions imposed; (3) an assessment by the Chancellor of the effectiveness of the campus program; (4) any proposed changes in the policy on illegal drugs. A copy of the report shall be provided to the President.

COURSE DESCRIPTIONS

The course descriptions are arranged first in alphabetical order according to course prefix reflecting the department or discipline of the course. Some courses are cross-listed, indicating that they are offered in two or more departments or disciplines. Within each of the prefix groups, the course descriptions are arranged by course number. Numbers 100-299 are courses intended primarily for freshmen and sophomores. Numbers 300-499 are courses intended primarily for juniors and seniors; numbers 490-498 are seminar, project, or special topics courses; number 499 is for undergraduate research.

Courses numbered 500 - 600 are taught at the Masters level and most are available to advanced undergraduates. Doctoral courses are numbered 700 - 899. Graduate courses numbered at the 500 and 700 levels are letter graded (A+ through F), while 600 and 800 level courses are S/U graded. Courses regularly letter graded (A+ through F) may not be taken for S/U grading by graduate students. Courses numbered in the 900 series are open to College of Veterinary Medicine students.

A typical course description shows the prefix, number, and title followed by prerequisite, credit and offering information. Prerequisites are courses or levels of achievement that a student is expected to have completed successfully prior to enrolling in a course. Corequisites are courses which should be taken concurrently by students who have not previously completed the Corequisites. Prerequisites or Corequisites for a given course may be waived by the instructor of the course or section. It is the student's responsibility to satisfy prerequisites, or obtain from the instructor written waiver of prerequisites, for any course in which he or she may enroll. Failure to satisfy prerequisites may result in removal from enrollment in the course. Consent of the department is required for all practicum and individual special topics or special problems courses as well as internships and thesis or dissertation research. Some courses also have restrictive statements, such as "Credit in both MA 141 and MA 131 is not allowed." Restrictive statements for a given course may be waived only by a college dean.

An example of credit information is: 4(3-2-1). The 4 indicates the number of semester hours credit awarded for satisfactory completion of the course. The (3-2-1) normally indicates that the course meets for three hours of lecture or seminar each week and for two hours of laboratory, and one hour of problem or studio each week. Some courses are offered for variable credit, and a listing of 1-6 indicates that from one to six semester hours of credit may be earned as arranged by the department writing the course.

Course Codes

ACC Accounting
ADN Art and Design
AEE Agricultural and Extension Education
AFS Africana Studies
ALS Agricultural and Life Sciences
ANS Animal Science
ANT Anthropology
ARC Architecture
ARE Agricultural and Resource Economics
ARS Arts Studies
AS Aerospace Studies
BAE Biological & Agricultural Engineering
BBS Bioprocessing
BCH Biochemistry
BEC Biomanufacturing
BIO Biological Sciences
BIT Biotechnology
BME Biomedical Engineering
BUS Business Management
CE Civil Engineering
CH Chemistry
CHE Chemical Engineering
CL Comparative Literature
CNR College of Natural Resources
COM Communication
CS Crop Science
CSC Computer Science
D Design
DAN Dance - Physical Education
DF Design Fundamentals
DS Design Studies
E Engineering
EAC Adult and Higher Education
EC Economics
ECD Counselor Education
ECE Electrical and Computer Engineering
ECI Curriculum and Instruction
ED Education
EDP Educational Psychology
EGM Mechatronics
ELM Elementary Education
ELP Educational Leadership & Policy Studies
EMS Mathematics, Sci, and Technology Education
ENG English
ENT Entomology
EOE Occupational Education
ES Environmental Science
ET Environmental Technology
FL Foreign Languages & Literatures
FLA Foreign Languages & Literatures - Arabic
FLC Foreign Languages & Literatures- Chinese
FLE Foreign Languages & Literatures- English

continued on next page

FLF	Foreign Languages & Literatures- French
FLG	Foreign Languages & Literatures- German
FLH	Foreign Languages & Literatures- Hebrew
FLI	Foreign Languages & Literatures- Italian
FLJ	Foreign Languages & Literatures- Japanese
FLK	Foreign Languages & Literatures- Swahili
FLN	Foreign Languages & Literatures- Hindi
FLP	Foreign Languages & Literatures- Portuguese
FLR	Foreign Languages & Literatures- Russian
FLS	Foreign Languages & Literatures- Spanish
FOR	Forestry
FS	Food Science
FW	Fisheries and Wildlife Sciences
GC	Graphic Communications
GD	Graphic Design
GEO	Geography
GN	Genetics
GRK	Foreign Languages and Literatures- Greek
GTI	Global Training Initiative
HA	History of Art
HI	History
HON	Honors
HS	Horticultural Science
HSS	Humanities and Social Sciences
ID	Industrial Design
IDS	Interdisciplinary Studies
IE	Industrial Engineering
IS	International Studies
LAR	Landscape Architecture
LAT	Foreign Languages and Literature- Latin
LOG	Logic
M	Management
MA	Mathematics
MAE	Mechanical and Aerospace Engineering
MB	Microbiology
MEA	Marine, Earth, and Atmospheric Sciences
MS	Military Science
MSE	Materials Science and Engineering
MT	Medical Textiles
MUS	Music
NE	Nuclear Engineering
NPS	Nonprofit Studies
NR	Natural Resources
NS	Naval Science
NTR	Nutrition
PB	Plant Biology
PCC	Polymer and Color Chemistry
PE	Physical Education
PEC	Physical Education- Coaching
PEF	Physical Education- Fitness
PEG	Physical Education- Golf
PEH	Physical Education- Health Studies
PEO	Physical Education- Outdoors
PER	Foreign Languages and Literature- Persian
PES	Physical Education- Sports
PHI	Philosophy
PMS	Physical and Mathematical Sciences
PO	Poultry Science
PP	Plant Pathology
PRT	Parks, Recreation and Tourism Management
PS	Political Science
PSY	Psychology
PY	Physics
REL	Religion
SOC	Sociology
SSC	Soil Science
ST	Statistics
STS	Science Technology and Society
SW	Social Work
T	Textiles
TAM	Textile & Apparel Management
TE	Textile Engineering
TED	Technology Education
TMS	Textile Material Science
TOX	Toxicology
TT	Textile Technology
USC	University Studies Courses
VMS	Veterinary Science
VMP	Veterinary Science
WGS	Women's and Gender Studies
WPS	Wood and Paper Science
ZO	Zoology

ACCOUNTING

ACC 200 Introduction to Managerial Accounting. *3(3-0-1) . F, S, Sum.* Analysis of accounting data that are useful in managerial decision making and in the control and evaluation of the decisions made within business organizations. An introduction to basic models, financial statement analysis, cost behavior analysis and cost control procedures.

ACC 210 Concepts of Financial Reporting. *3(3-0-0) . F,S,Sum.* Financial reporting concepts, the accounting information generating process, reporting practices, financial statement preparation, and the interpretation and analysis of financial statements. Basic accounting principles and concepts, the accountingcycle, income measurement, and internal controls.

ACC 310 Intermediate Financial Accounting I. *3(3-0-0) . F,S,Sum. Preq: ACC 210.* Conceptual framework of financial accounting and process of development of professional standards. Foundations of accounting and reporting systems. Measurement and reporting issues for cash, receivables, inventories, and non-current assets.

ACC 311 Intermediate Financial Accounting II. *3(3-0-0) . F,S,Sum. Preq: ACC 310 with grade of C- or better.* A continuation of topics introduced in Intermediate Financial Accounting 1 (ACC 310). Topics include accounting for investments in equity and debt securities, measurement and recognition of current and non-current liabilities, accounting for operating and capital leases, accounting for pension and post-retirement benefit plans, determination and classification issues related to deferred income taxes, and accounting for various forms of stock-based compensation plans.

ACC 330 An Introduction To Income Taxation. *3(3-0-0) . F,S,Sum. Preq: ACC 210 with a grade of C- or better.* Basic income tax principles and procedures (including research and planning) with an emphasis on all types of entities and business transactions. Exposure to a range of tax concepts within the framework of financial reporting.

ACC 340 Accounting Information Systems. *3(3-0-0) . F, S, Sum. Preq: ACC 200 and ACC 210 with a grade of C- or better.* Introduction to the importance of accounting and computer-based controls in an organization's enterprise systems. Focus on business processes, entity-wide information systems controls and security, database modeling and design focused on accounting,and contemporary issues involved in providing assurance services for systems reliability.

ACC 410 Governmental and Nonprofit Accounting. *3(3-0-0) . F,S. Preq: ACC 210.* Accounting for state and local governments, including budgeting, audit issues, and financial analysis. Accounting for nonprofit organizations, including colleges and universities and healthcare organizations.

ACC 411 Business Valuation. *3(3-0-0) . F,S,Sum. Preq: ACC 210, BUS 320, BUS 350.* Conceptual framework of how businesses work, value generation and reporting. Interpretation of financial statements and their use in valuation of the firm.

ACC 420 Strategic Finance and Planning. *3(3-0-0) . F,S,Sum. Preq: ACC 200 with grade of C- or better.* Strategic finance in planning, control, and evaluating organizational activities and in designing and implementing business strategies. Use of accounting in corporate management and business planning. Integration of performance measurement and cost control with corporate strategy.

ACC 440 Enterprise Resource Planning Systems. *3(3-0-0) . S. Preq: ACC 340 with grade of C- or better.* Survey of the varied types of enterprise software available to companies with enterprise resource planning (ERP) systems as the primary foundation. Focus on company-wide data integration enabled by ERP systems and other enterprise software such as customer relationship management, knowledge management, business intelligence and the Balanced Scorecard. Students should gain an appreciation of the managerial, accounting, security and technical issues surrounding the adoption, design, implementation, and use of these solutions while developing hands-on knowledge. Credit will not be allowed for both ACC 440 and BUS 540.

ACC 450 Risk and Assurance. *3(3-0-0) . F,S,Sum. Preq: ACC 311 with a grade of C- or better.* Introduction to assurance services objectives, theory, and practices. Focuses on developing skills for interpreting business strategies and identifying related business risks, describing internal control solutions to those risks, identifying evidential sources, providing assurance about those risks and controls, and designing strategies to provide assurance services about the reliability of business information.

ACC 470 Accounting Theory. *3(3-0-0) . Preq: ACC 410 (312).* Major concepts, problem areas and trends in accounting thought and practice, including a review of the most prominent controversies in current publications and the most recent relevant pronouncements of professional institutions.

ACC 480 Accelerated Survey of Financial and Management Accounting. *3(3-0-0) . F.* Accelerated survey of basic concepts underlying accounting in profit-oriented firms: data measurement, summarization and reporting practices as a background for use of accounting information; content of published financial statements; and uses of accounting for management decisions in product costing, budgeting, and operations. Credit may not be received for both ACC 480 and ACC 220 or 280. Intended for graduate students and advanced undergraduates not majoring in Accounting or Management

ACC 490 Senior Seminar in Accounting. *3(3-0-0) . S. Preq: Accounting Majors in final semester of study or PBS status admitted by permission of department head.* Integration of financial, managerial, tax, and governmental accounting. Application of appropriate accounting methods to problem resolution.

ACC 495 Special Topics in Accounting. *1-6. Preq: Consent of Instructor.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

ACC 498 Independent Study in Accounting. *1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with the associate department head.

ACC 499 Internship in ACC. *6(0-0-0) . S, SUM1, SUM2. Preq: Senior standing, min. 3.2 GPA, consent of instructor..* A full-time professional internship in accounting. Eligibility for participation to be by invitation and by the demand for interns among accounting firms participating in the internship program. Participants will communicate with instructor weeklyover the course of the internship to discuss progress and insights. A post-internship interview and paper is also required. Internships vary in duration from 8 to 15 weeks. Restricted to ACF, ACS, & ACM majors.

ART AND DESIGN

ADN 102 Design Fundamentals for Art & Design. *6(9-2-0) . S. Preq: DF 101.* The second introductory studio in the fundamental concepts, skills and experiences of designing in two and three dimensions for Art & Design majors.

ADN 111 Two Dimensional Design for Non-Design Majors. *3(0-6-0) . F,S. Preq: Non-Design student.* An introduction to the fundamentals of design studies through two dimensional problems. The basic elements and concepts of design explored as abstract and applied problems through design issues. Provides non-design students an introduction to designprinciples and a language of design.

ADN 112 Three Dimensional Design for Non-Design Majors. *3(0-6-0) . F,S. Preq: Non-Design student.* An introduction to the fundamentals of design studies through three-dimensional problems. The basic elements and concepts of design explored as abstract and applied problems through the design issue. Provides non-design students a working knowledge of design principles and a language of design.

ADN 202 Design Studio: Art & Design in Context. *6(0-9-0) . S. Preq: DF 101 and DF 102 or two studios.* Investigative problem solving in visual communication in the human environment. Emphasis on visual language applied to specific contexts.

ADN 212 Basic Photography. *3(2-2-0) . F,S. Preq: DF 102.* Introduction to the processes and visual skills necessary for the beginning photographer. Darkroom experimentation, pinhole camera, basic rudiments of camera use, film development and printing. Exploration of issues related to the quality of visual communication.

ADN 219 Digital Imaging. *3(2-2-0) . F,S. Preq: DF 102.* Introduction to exploring, creating, and modifying images through the use of computers. Emphasis is on creativity, experimentation, and intuitive image-making using various computer techniques.

ADN 272 Introduction to Printing and Surface Design. *3(0-6-0) . F,S. Preq: A grade of C or better in DF 101, ADN 111 or ADN 112.* Design and production of screen printed, painted and pattern-dyed fabrics. Development of design abilities (color use, pattern generation) and technical skills (screen printing, painting, use of fabric dyes). Production of fabric samples, studies, yardage, and/or end products. Awareness of industrial processes.

ADN 273 Fibers Materials and Processes. *3(0-6-0) . F,S. Preq: DF 101 or ADN 111 or ADN 112.* Introduction to historical and contemporary hand processes used by the textile designer. Students will learn a variety of textile techniques utilizing traditional and experimental methods. Emphasis will be on technical exploration and development.

ADN 281 Basic Drawing. *3(0-6-0) . F. Preq: Design Majors and Design Minors.* A beginning descriptive drawing experience which teaches students to see, analyze, and transcribe observed subject matters. The transcription incorporates formal drawing issues (line, form, texture) with traditional and contemporary material space exploration.

ADN 292 Special Topics in Design. *1-3. F,S.* Topics of current interest in the College of Design. Used to develop new courses.

ADN 302 Design Studio: History, Culture & Diversity. *6(0-9-0) . S. Preq: Five studios and HA 202.* Investigations into the historical, cultural, perceptual and aesthetic values and precedents of modern art/design movement. In a studio mode, emphasis is on research, documentation, synthetic and analytic activities.

ADN 311 Basic Visual Laboratories. *3(0-6-0) . F,S. Preq: Design Majors: DF 102; Non-Design Majors: ADN 111, 112.* Basic activities that relate to the major design areas in the College of Design. Study of visual communication skills in areas of illustration, printmaking, and life drawing. The student elects instructor and area(s) of activity.

ADN 312 Intermediate Photography. *3(2-2-0) . F,S. Preq: ADN 212.* Continuation of an advanced level of the skills and techniques developed in Basic Photography. Purpose is to develop use of camera as a perceptual tool to increase awareness and sensitivity of visual imagery.

ADN 319 Introduction to Animation. *3(3-0-0) . F,S.* An intensive introduction to animation which integrates traditional hand generated animation, digital techniques and technology. Students will explore animation's fundamental principles of linear formats, sequenced movement and time-based imaging.

ADN 384 Basic Painting. *3(0-6-0) . F. Preq: DF 102; or both ADN 111 and ADN 112.* Introduction to the principles of painting through class projects that expose students to different painting materials and techniques. Students learn to build a stretcher, size and prime a canvas as well as other rigid painting surfaces. Acrylic andoil paint used; projects assigned and open themes.

ADN 386 Basic Sculpture. *3(0-6-0) . F. Preq: DF 101, ADN 112.* Studio course introducing basic concepts, materials, and processes of sculpture. Instruction incorporates both traditional and contemporary form generation with emphasis on developing formal perception and projection.

ADN 400 Design Studio. *6(0-9-0) . F,S. Preq: ADN 102.* Studio offering upper-level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.). Course may be used to partially satisfy studio requirement in all undergraduate degree programs in the College of Design

ADN 402 Senior Studio. *6(0-9-0) . S. Preq: Seven studios and ADN 219.* Advanced Design studio emphasizing the exploration of past, current and potential future technologies within Design Department content areas (e.g., painting, sculpture, fibers, jewelry, color and light, etc.). Students are expected to work independently, develop their own problem statements.

ADN 411 Visual Laboratory II. *3(0-6-0) . F,S. Preq: DF 102; or both ADN 111 and ADN 112.* Visual communication skills in the areas of life drawing, illustration, painting, print making and sculpture. May be taken for a minimum of 12 credit hours by College of Design students

ADN 413 Synthetic Drawing. *3(2-3-0) . Every 3rd Sem. Preq: DF 102; or ADN 111, ADN 112.* Orthographic and axonometric projections, coordinating and perspective systems, and diagramming to facilitate the drawing of shapes and forms conceived by the designer in order to make visually precise simulations of design ideas.

ADN 414 Color and Light. *3(3-0-0) . F,S.* Physical and perceptual nature of color, color awareness, sensitivity and skills in visual communication with color as a designer's tool.

ADN 418 Contemporary Issues in Art and Design. *3(3-0-0) . S. Preq: History of Art I & II or Junior standing, Design Majors.* Explore a range of issues about contemporary art and design ideologies. Concentration on selected readings which provide a platform for discussion of various ideas, approaches, perspectives and practices in the contemporary fields of art and design.

ADN 419 Multimedia and Digital Imaging. *3(3-0-0) . F,S. Preq: DF 102, ADN 219.* Intensive hands-on investigation of the tools, techniques, and processes for the development of interactive multi-media projects. Media teams will emphasize shaping an idea into a well thought-out design that works as an interactive experience.

ADN 428 Art and Design: Theory and Practice. *3(3-0-0) . F. Preq: 6 Studios; Senior Level. Art and Design.* Conceptual basis for developing a personal philosophy regarding the practice of art and design. Theory based history of diverse cultures and forces of change: political, economic, religious, social, intellectual and philosophical as they affect thefields of art and design.

ADN 454 Geometry for Designers. *3(3-0-0) . S. Preq: Junior standing.* Geometry and its application to the various fields of design, mathematical and drawing skills required.

ADN 455 Building Workshop. *3(2-2-0) . Every 3rd Sem. Preq: DF 102 or both ADN 111 and ADN 112.* Process and logic of producing one's own design. Structural behavior, geometry, and materials in the construction of physical form usually at a large scale. Evaluative testing with critical support.

ADN 460 Multimedia and Advanced Digital Imaging Studio. *6(0-9-0) . F, Sum. Preq: ADN 219.* An intensive study of advanced image-making processes, software, and various computer platforms used in the creation of multimedia. In a studio mode, students will place emphasis on creating interactive programs and finally transfer images to CD Rom and video with audio and special effects.

ADN 470 Fibers and Surface Design Studio. *6(0-9-0) . F,S. Preq: A grade of C or better in DF 101 or ADN 111 and ADN 112; Design Majors or Design Minors.* Practice of widely varying textile techniques with the solving of practical and conceptual design problems. Textile end products are designed and produced at full scale in appropriate materials. Focus includes weaving, knitting, printing and dyeing of fabrics, and a wide variety of fabric construction and embellishment processes. Textile history is an ongoing part of the study. Emphasis on synthesis of techniques and ideas.

ADN 472 Advanced Surface Design. *3(0-6-0) . F,S. Preq: DF 101, ADN 272.* Advanced problems in the design and production of hand-printed and pattern-dyed fabrics. Experimentation with advanced color application techniques. Exploration of pattern and image production on fabric and development of design abilities in textilemedia. Specific focus changes each semester.

ADN 475 Pre-Industrial World Textiles. *3(3-0-0) . S (Every 2 Yrs.). Preq: Sophomore standing.* Research on and discussion of hand-made textiles of the world, introducing major textile traditions from Africa, Asia, Europe, North and South America. Focus on geographic and cultural contexts, developments in making, and design characteristics, including impact of 20th century fiber art movements. Seminar format.

ADN 480 Intermediate Studio. *6(0-9-0) . F,S. Preq: DF 101 and DF 102; or ADN 111, ADN 112 and ADN 311.* Studio format offering upper level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.) through individual study in drawing, painting, sculpture, photography, or printmaking.

ADN 481 Intermediate Drawing. *3(0-6-0) . S. Preq: ADN 281.* An intermediate-level drawing course that further develops the designer's graphic, analytic, observational, and conceptual skills.

ADN 484 Intermediate Painting. *3(0-6-0) . S. Preq: DF 102; or both ADN 111 and ADN 112.* An intermediate-level painting course that through slide lectures, class projects, and assigned readings exposes students to contemporary painting art movements. Special emphasis given to the formal and interpretative analysis of a painting. Acrylicand oil paint are used; Projects have assigned and open themes.

ADN 486 Intermediate Sculpture. *3(0-6-0) . S. Preq: ADN 386.* An intermediate-level sculpture course that further develops the designer's analytic, observational, and conceptual skills.

ADN 487 Sculpture: Life Modeling. *3(0-6-0) . F. Preq: DF 102 or ADN 486.* A studio course with direct observation of nature a primary concern. In-depth study of specific modeling concepts and processes.

ADN 490 Art and Design International Studio. *6(0-9-0) . F,S,Sum. Preq: Junior standing, Design Majors, Approval Study Abroad Office.* Define Art and Design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary art forms. Focus on artifact making through direct studies. Taught off campus.

ADN 491 Special Seminar in Design. *1-3. F,S.* Seminars on subjects of current interest in design.

ADN 492 Special Topics in Design. *1-3. F,S.* Topics of current interest in Design & Technology. Used to develop new courses.

ADN 494 Internship in Design. *3-6. F,S,Sum. Preq: Junior standing; 3.0 GPA or better.* Supervised field experience in design offices, galleries, museums and other organizations. May be taken for a maximum of 6 credit hours

ADN 495 Intdependent Study in Design. *1-6. F,S. Preq: Junior standing in Design with 3.0 in Design or better.* Special projects in art and design developed under the direction of a faculty member on a tutorial basis. May be taken for a maximum of 6 credit hours

AGRICULTURAL AND EXTENSION EDUCATION

AEE 101 Introduction to Career and Technical Education. *1(1-0-0) . F.* Overview of career and technical education programs, objectives, and outcomes in secondary schools. Philosophy of career and technical education and how career and technical education programs fit into the overall mission of secondary education. Mission of agricultural education, major program objectives, and introduction to the curricula taught within the state. Roles and responsibilities of CTE teachers with specific emphasis on agricultural education teachers' roles and responsibilities.Historical context of agricultural education and other career and technical education programs, including major legislation affecting development of career and technical education.

AEE 103 Fundamentals of Agricultural and Extension Education. *1(1-0-0) . F.* Introduction to the scope, purpose, and objectives of university education with an emphasis on agricultural education, extension education, and agricultural communications. Students will explore College and departmental resources, academic policiesand procedures, the agricultural industry, career opportunities, and current trends and issues in agriculture. Cannot receive credit for both AEE 103 and ALS 103

AEE (ED) 206 Introduction to Teaching Agriculture. *3(2-3-0) . F.* Introduction to teaching agricultural education in middle and secondary schools and collaborative efforts for teaching agricultural education to adults as rural community situations dictate. Field experiences include three hours per week of structured observations of classroom teachers, teacher assistant activities, and reflections of the experience.

AEE (ED, EOE) 226 Computer Applications and Information Technology in Agricultural & Extension Ed. *3(1-4-0) . F,S.* Use of computers and commercially produced agricultural software; the computer as a management tool; agricultural occupational applications of the computer; a multimedia instructional tool in agricultural classrooms and training situations; use of technology for processing information and imaging; network access; and electronic communications.

AEE 230 Introduction to Cooperative Extension. *2(1-3-0) . F.* History, organization, and mission of Cooperative Extension in the United States. Structure of local extension offices. Exploration of extension careers. Field experience in an extension office required.

AEE (ED) 303 Administration and Supervision of Student Organizations. *3(2-2-0) . Preq: AEE 206 or EOE 207.* Principles and techniques for organizing, administering and supervising student organization activities.

AEE 311 Communication Methods and Media. *3(3-0-0) . F. Preq: ENG 101.* Foundations of agricultural communications. Technologies of agricultural communication and the systematic approach to the development of agricultural communication materials. Development of applied skills in design, production, evaluation, and dissemination of information unique to agricultural sciences and media.

AEE (ED) 322 Experiential Learning in Agriculture. *2(2-0-0) . F.* Planning, organizing, implementing, supervising and evaluating Supervised Agricultural Experience (SAE) programs in agriculture.

AEE 323 Leadership Development in Agriculture. *3(2-0-0) . F.* Leadership development in agricultural and related settings; principles and techniques for developing leadership skills; development of understanding of the dynamic interactions of personal characteristics, technical skills, interpersonal influence,commitment, goals and power necessary for effective leaders; issues and problems facing the leadership of agriculture.

AEE 325 Planning and Delivering Non-Formal Education. *3(2-2-0) . F. Preq: AEE 230.* Adult learning theory and practice, including planning non-formal educational programs for adults, methods of instructional delivery, effective use of instructional technology, marketing educational programs, and evaluation of educational outcomes.Microteaching (practice teaching presentations) and group presentations required as part of laboratory assignments.

AEE (ED) 327 Conducting Summer Programs in Agricultural Education. *1(0-3-0) . F. Preq: AEE(ED)206; AEE(ED)322; and AEE 323.* Field experience emphasizing summer agricultural education programs. Individualized instruction for students during supervised agricultural experience visits and youth organization activities. Professional development and program improvement activities.

AEE 350 Personal Leadership Development in Agriculture. *3(3-0-0) . S.* This course focuses on the impact of personal leadership on agricultural organizations and society. The best leaders are those who have internalized personal leadership concepts and apply them to the practical situations in their environment. Thiscourse teaches individuals to achieve optimal results by changing their fundamental approach to work, relationships, and problem solving, using time-honored principles in time management, leadership, and effectiveness. Restricted to CALS students.

AEE 360 Developing Team Leadership in Agriculture. *3(3-0-0) . F. Preq: AEE 323-Leadership Development in Agriculture.* Students in this course will study the impact of organized teams and team leaders on the development of agricultural organizations. Principles and techniques involved in creating, organizing and directing teams will be explored. Students will develop skills in team decision-making and communication. Topics of discussion will include: components of a group and team, relationships of group and team members, effectiveness of groups and teams, and communication within groups and teams. This course is designed for students who are interested in positions of leadership and who want to learn more about making the groups and teams they work with more effective. Restricted to CALS students.

AEE 423 Practicum in Agricultural Extension/Industry. *1-8. S, Sum. Preq: AEE(ED) 426, Senior standing and Consent of Instructor. Coreq: AEE (ED) 490.* Participation in professional work experiences in preparation for effective leadership positions in the Cooperative Extension Service or the agribusiness industry.

AEE (ED) 424 Planning Agricultural Educational Programs. *3(3-0-0) . S. Preq: AEE(ED) 426. Coreq: AEE(ED) 427.* Principles of program planning applied to educational programs in agriculture; theory and field experiences in planning, organizing, and evaluating secondary agricultural education programs; development of plans for conducting all aspects of the complete agricultural education program.

AEE (ED, EOE) 426 Methods of Teaching Agriculture. *3(2-2-0) . F. Preq: Junior standing.* Discussion and practice in planning and presenting instruction in agriculture in formal and informal settings. Principles and application of approaches to teaching and organizing instruction, motivating students, developing instructional objectives, selecting and using teaching techniques, evaluating instruction, and managing classroom and laboratory instruction.

AEE (ED, EOE) 427 Student Teaching in Agriculture. *8(2-15-0) . S. Preq: AEE (ED) 426; Admission to Professional Semester. Coreq: AEE (ED) 490, AEE (ED) 424;.* Skills and techniques in teaching agriculture in a public school setting. Secondary agricultural education program teaching experience under the supervision of university faculty and an experienced agriculture teacher.

AEE 435 Professional Presentations in Agricultural Organizations. *3(3-0-0) . S.* This course teaches effective listening strategies, communication strategies, interpersonal skills and presentation strategies essential for use in today's workplace. AEE 435 includes strategies and techniques for effective presentations in the food, agricultural, natural resources, as well as other professions, with emphasis on oral and visual presentation techniques. Presentation skills and strategies for formal and informal situations including conferences, poster presentations along with leadership, conflict resolution, interviewing, negotiation, and group communication theory and strategies will be discussed. Restricted to CALS students; Jr or Sr level status required.

AEE 460 Organizational Leadership Development in Agriculture. *3(3-0-0) . S. Preq: AEE 323-Leadership Development in Agriculture.* This course focuses on the impact of effective leadership in organizations in both theory and practice. Students will examine the major theories and studies that are most relevant and informative with the regard to leadership in organizations. Students will develop skills in decision-making, management of organizations, and ethical leadership related to agricultural organizations. Restricted to CALS students.

AEE 470 Agricultural Communications. *3(3-0-0) . S. Preq: AEE 311, Senior standing.* Use of agricultural communication materials. Emphasis on application of principles, materials and processes of B&W and color photography to problems of communication and the development of visual presentation materials for instruction and training.

AEE 478 Extension as Non-Formal Education. *3(3-0-0) . S. Preq: Advanced Undergraduate standing or PBS status.* Extension as a system of non-formal education, how it functions in USA and other countries (with special attention to agricultural extension), historical antecedents and philosophical foundations, mission, organization, methods, problems dealt with;how technology and behavioral sciences are/can be utilized; provides actual experience with extension and with conceptual/theoretical ideas that undergird practice.

AEE 490 Seminar in Agricultural and Extension Education. *1(1-0-0) . S, Sum. Preq: Admission to Professional Semester.* Analysis of opportunities and challenges facing educational leaders in agriculture.

AEE 492 External Learning Experience in Agricultural and Extension Education. *1-6. F,S,Sum. Preq: Sophomore standing.* Learning experience within an academic framework that utilizes facilities and resources external to the campus. Contact and arrangements with prospective employers initiated by the student and approved by the faculty adviser, prospective employer, and the departmental teaching coordinator prior to the experience. Not intended for teaching licensure for students in AEE

AEE 493 Special Problems in Agriculture and Extension Education. *1-6. F,S,Sum. Preq: Sophomore standing.* A learning experience in agriculture and extension education within an academic framework that utilizes departmental campus facilities and resources. Arrangements must be initiated by the student and approved by a faculty adviser and the departmental teaching coordinator. Not intended for teacher licensure for students in AEE.

AEE 495 Special Topics in Agricultural and Extension Education. *1-3. F,S,Sum.* Offered as needed to present material not normally available in regular course offerings or for offerings of new courses on a trial basis. Not intended for teacher licensure for students in AEE.

AFRICANA STUDIES

AFS (MUS) 230 Introduction to African-American Music. *3(3-0-0) . F.* Comprehensive survey of African-American music in the United States from Colonial times to the, with emphasis on its unique features and contributions to American culture.

AFS 240 African Civilization. *3(3-0-0) . F,S,Sum.* An interdisciplinary study of centers of African civilization from antiquity to the 1960s. Such centers include ancient Egypt, Nubia, Axum, Ghana, Mali, Songhai, Kilwa, Malinda, Sofola, Zinzibar and Mononotapa.

AFS 241 Introduction to African-American Studies II. *3(3-0-0) . F,S,Sum.* Second in a two semester sequence in the interdisciplinary study of sub-Saharan Africa, its arts, culture, and people, and the African-American experience.

AFS (ENG) 248 Survey of African-American Literature. *3(3-0-0) . F,S.* African-American writing and its relationships to American culture and history. Covers such writers as Wheatley, Douglass, Chesnutt, Dunbar, DuBois, Hughes, Hurston, Wright, and Morrison.

AFS (MUS) 260 History of Jazz. *3(3-0-0) . Alt yrs.* History of jazz and the contributions of major artists. Emphasis of the various styles that have contributed to this American art form. Investigation of structural forms in the jazz idiom.

AFS (HI) 275 Introduction to History of South and East Africa. *3(3-0-0) . F, S, Sum.* The African kingdoms (Lunda, Buganda, and Zulu); the European encroachment; the origins of colonialism and the character of colonial societies and economies, South African apartheid; African protect, nationalism and independence.

AFS (HI) 276 Introduction to History of West Africa. *3(3-0-0) . F,S.* The history of Western Africa. Forest civilizations and the slave trade, trade and the expansion of Islam, colonialism in West Africa; African nationalism and the achievement of independence; and postcolonial West Africa.

AFS (SOC) 305 Racial and Ethnic Relations. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Study of the nature of the relationships among racial and ethnic groups in societies around the world but with emphasis on the United States. Explores topics such as inequalities of wealth, power, and status, racism, conflict, and social boundaries among groups. Current trends in intergroup relations are discussed.

AFS (COM) 340 African American Theatre. *3(3-0-0) . S.* This course examines African American dramaturgy and its impact on American theatre. We will study plays from the early period, 1847-1938, and from the recent period, 1935 to the present. This course will investigate the thematic structure of eachsection of plays including family life, social protest, and religion. The course will also help students to better understand the social milieu that shaped the content of each play.

AFS 342 Introduction to the African Diaspora. *3(3-0-0) . S.* Exploration of the global experiences of people of African descent. Geographical areas include the America, Europe, Asia, and the Caribbean. Exploration of the web of interrelated histories, social dynamics, and politico-economic processes affecting and reflecting world cultures and histories. Foundational course for the exploration of methodological issues and theoretical concerns in the field of African Diaspora Studies

AFS 343 African Religions. *3(3-0-0) . S, Alt. yrs.(odd).* Examination of African Religions on the African continent and throughout the African Diaspora. Focus on traditional religious practices, African reformulation of Islam and Christianity, New Orleans and Haitian vodun, Cuban Santeria, and Brazilian Candomble. Designed to de-mystify African religion without divesting it of its cultural uniqueness and richness.

AFS 344 Leadership in African American Communities. *3(3-0-0) . F,S.* Historical, cultural and political examination of the dynamics of leadership in African American communities. Focus on structure of Leadership in the context of gender, ideology, and style. Interdisciplinary examination of impact of leaders on broader American society.

AFS (PSY) 345 Psychology and the African American Experience. *3(3-0-0) . F, Alt. yrs.(odd). Preq: PSY 200 or PSY 201.* Historical and cultural examination of the psychological experiences of African American experience from pre-American times to the present. Focus on mental health, personality, identity development, racism, oppression, psychological empowerment andan African-centered world view. Discussion of contemporary issues within the African American community.

AFS (ARS) 346 Black Popular Culture. *3(3-0-0) . F,S,Sum.* A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse.

AFS (ENG) 349 African Literature in English. *3(3-0-0) . S. Preq: Sophomore standing.* Anglophone literature in Africa. Emphasis on the relationship between the African world-view and literary production and the

persistent trend by African writers to connect literature with politics. Writers such as Achebe, Ngugi, Soyinka, and Serote.

AFS (HI) 372 African-American History Through the Civil War, 1619-1865. *3(3-0-0) . Preq: 3 hours of history or Sophomore standing.* African background and continuity of the particular role, experience and influence of African Americans in the United States through the Civil War.

AFS (HI) 373 African-American History Since 1865. *3(3-0-0) . Preq: 3 hours of history or Sophomore standing.* The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present.

AFS (ENG) 375 African American Cinema. *3(3-0-0) . F. Preq: ENG 101.* Survey and analysis of African American film culture from 1900-present. Examination of pre-Hollywood, classical Hollywood, and Independent filmmaking. Particular focus on independent filmmakers' response to dominant industry representations and the work of filmmakers who seek to create a specifically African American cinematic style.

AFS (PS) 409 Black Political Participation in America. *3(3-0-0) . F.* African American political participation in the United States; political culture, socialization, and mobilization, with a focus on the interaction between African Americans and actors, institutions, processes, and policies of the American political system.

AFS 440 Senior Seminar in Africana Studies. *3(3-0-0) . S. Preq: AFS 342; Africana Studies Majors or Africana Studies Minors.* In-depth examination of Africana Studies issues. Interdisciplinary exploration of key problems and proposed solutions for African communities on the African continent and throughout the world. Requires written research project using interdisciplinary approaches and critical analyses.

AFS 442 Issues in the African Diaspora. *3(3-0-0) . F, Alt. yrs.(odd).* Multidisciplinary exploration of the interrelated histories, social dynamics, and politico-economic processes of the experiences of people of African descent throughout the world. Particular focus on the experiences of slavery, artistic expression,gender practices, and the impact of the nation state.

AFS (ENG) 448 African-American Literature. *3(3-0-0) . S. Preq: Junior standing.* Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Huston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

AFS (HI) 455 History of the Civil Rights Movement. *3(3-0-0) . Alt. yrs.. Preq: Junior standing.* The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for HI 455 and HI 555

AFS (HI) 475 History of the Republic of South Africa. *3(3-0-0) . F,S. Preq: 3 hours of history.* Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI 475 and HI 575

AFS (HI) 476 Leadership in Modern Africa. *3(3-0-0) . Alt. yrs.. Preq: 3 hours of history.* Recent sub-Saharan African political history (excluding South Africa). Overview of concepts, vocabulary, historical trends. Detailed examination of specific African countries as case studies, such as Ghana, Nigeria, Zimbabwe, Tanzania.

AFS (HI) 479 Africa (sub-Saharan) in the Twentieth Century. *3(3-0-0) . S,Alt. yrs.(even). Preq: 3 hrs. of history.* Developments in sub-Saharan Africa during the colonial period, from the end of the nineteenth century to the advent of decolonization in the early 1960s. Interplay of political, social, economic and cultural factors in the experiences of African peoples during this period. Credit will not be given for both HI 479 and 579.

AFS 490 Africana Studies and Community Involvement. *3(1.50-0-5) . F. Preq: Africana Studies Majors or Africana Studies Minors.* First part of a two semester service-learning experience. Provides interdisciplinary and experientially based opportunity for students to engage in community and classroom-based experiences that examine issues of relevance to African American people(or communities in the African Diaspora). Students apply and examine concepts addressed in class to their own practical experience in service to others. Development of interpersonal and professional skills. Focus on the values, beliefs, attitudes, and ideas that are central to definitions of democracy, social justice, civic resiliency, self-help, and public life.

AFS 491 Study Abroad in Africana Studies. *3(3-0-0) . Sum.* Specific category of revolving set of field/seminar courses involving multidisciplinary focal areas taught in foreign countries through Africana Studies. Course includes pre-trip orientation and readings and onsite field experiences and lectures. Additional program fees, travel costs and appropriate immunizations are required beyond registration fees.

AFS 497 Topics in African-American Studies. *3(3-0-0) . F,S. Preq: AFS 240.* Multidisciplinary examination of selected topics in African-American studies.

AGRICULTURE AND LIFE SCIENCES

ALS 103 Introductory Topics in Agriculture and Life Sciences. *1(1-0-0) . F,S. Preq: Freshman standing or Sophomore standing.* Introduction to scope and objectives of university education. Emphasis on sciences, particularly as related to agriculture and life sciences. Departmental programs, computers, career opportunities and more.

ALS 110 Career Exploration Seminar. *1(1-0-0) . S. Preq: Ag and Life Science Majors.* Students learn about the career decision-making process through integration of self-knowledge and research in the world of work. Emphasis is placed on Agriculture and Life Sciences careers. Course is targeted towards undeclared majors, or those who desire experiences in career exploration and planning. Students assess interests, values, skills and personal strengths while learning about a variety of occupational resources. Effective career management and job seeking skills emphasized. Career mentors are utilized for each student.

ALS 295 Special Topics in Agriculture and Life Sciences. *1-3. F,S,Sum.* Offered as needed to present material not normally available in regular departmental course offerings; or for offerings of new courses on a trial basis.

ALS 303 Professional Development and Career Opportunities in Agriculture and Life Scienc. *1(1-0-0) . F, S. Preq: External transfers or NCSU students with 45 hours or more. CALS Majors..* Transfer students receive an overview of academic policies and career services. Students learn strategies to reach their career goals. Students design a resume and a cover letter and participate in mock interview. Students research and identify internships and begin to construct a skills portfolio. Professional skills are enhances. Students increase their understanding of career and graduate school options after graduation. Students will not receive credit for both ALS 103 and ALS 303.

ALS 398 Agriculture and Life Sciences Honors Seminar. *2(2-0-0) . S. Preq: Enrollment by invitation for sophomores or juniors in CALS with GPA 3.35 or higher..* A seminar/discussion honors course with emphasis on a team approach to scientific research into topics that link science with issues in society; exposure to leadership skills and bioethics; requirement of detailed written or oral reports; career development in the agricultural and life sciences; required participation in on- and off-campus scholarly retreats.

ALS 494 International Learning Experience in Agriculture and Life Sciences. *1-6. F,S,SUM1,SUM2.* Course offered as needed for international learning experiences in agriculture and life sciences involving international travel and immersion in an international culture. A written report is required and student must identify a faculty member to work with them. Travel expenses may be incurred by the student. Departmental Approval Required.

ALS 495 Special Topics in Agriculture and Life Sciences. *1-3. F,S,Sum.* Offered as needed to present material not normally available in regular departmental course offerings or for offering of new courses on a trial basis.

ALS 498 Honors Research or Teaching I. *1-3. F,S,Sum. Preq: ALS 398, GPA 3.25 or higher.* Honors research or teaching for students in Agriculture and Life Sciences. First of a two-course sequence. Identification of a project and development of a proposal; literature search, planning, and work initiation. A maximum of 6 credits for ALS 498 & ALS 499 combined.

ALS 499 Honors Research or Teaching II. *2-4. F,S,Sum. Preq: ALS 498, GPA 3.25 or higher.* Honors research or teaching for students in Agriculture and Life Sciences. Completion of work initiated in ALS 498. Analysis of results. Preparation and presentation of written and oral reports. A maximum of 6 credits for ALS 498 and ALS 499 combined.

ANIMAL SCIENCE

ANS 105 Introduction to Companion Animals. *3(3-0-0) . F,S. Preq: Freshman standing or Sophomore standing.* Introduction to animals that people keep as companions. Variation, behavior, anatomy, physiology, disease, and training of animals as diverse as fish, snakes, mice, rats, birds, cats, and dogs. Special relationships between humans and companion animals in a societal context.

ANS 110 Introduction to Equine Science. *3(3-0-0) . F. Preq: Freshman standing or Sophomore standing.* History, management, and use of horses and their profound impact on society. Selection, care, and enjoyment of horses with emphasis on genetics, nutrition, reproduction, behavior, and health.

ANS 150 Introduction to Animal Science. *4(3-3-0) . F,S.* Fundamental principles of animal management; contributions of animals and animal products to humanity; application of science to animal production; issues regarding animal production.

ANS 201 Techniques of Animal Care. *2(0-4-0) . S. Preq: ANS 150 or ANS 230, IAS Majors or SAS Majors.* A laboratory course in the applied management of beef cattle, dairy cattle, swine and small ruminants with participatory assignments of common techniques utilized in livestock production.

ANS 202 Techniques of Horse Care. *2(0-4-0) . S. Preq: ANS 150, IAS Majors or SAS Major.* Opportunities to learn applied management skills required in horse production, with emphasis on common techniques utilized in horse production.

ANS 205 Anatomy and Physiology of Domestic Animals. *4(3-2-0) . F,S. Preq: ZO 160 or BIO 183; ANS 150.* This course is designed to introduce students to mammalian anatomy and physiology (structure and function) with emphasis on livestock species. Students will gain a basic understanding of body systems including circulatory, muscular, skeletal, digestive, and reproductive systems and functions of those systems with relevance to the whole animal and maintenance of homeostasis. In lab students will learn to identify major anatomical and cellular structures through examination of gross and microscopic anatomy.

ANS (HS) 215 Basic Agricultural Genetics. *3(3-0-0) . F. Preq: ZO 160, BIO 183 or BIO 125.* Basic principles of inheritance in plants and animals of agricultural significance. Emphasis on transmission genetics and its effects on the usefulness of plants and animals. Introduction to basic principles of plant and animal improvement.

ANS 220 Reproduction and Lactation in Domestic Animals. *4(3-3-0) . F,S. Preq: ANS 205.* Biological processes in reproduction and lactation with emphasis on domestic animals. Environmental and genetic factors that affect these processes. Identification, evaluation and solutions of problems in these physiological areas.

ANS 225 Principles of Animal Nutrition. *3(3-0-0) . Sum.* This online Principles of Animal Nutrition course is designed for non-Animal Science majors and off-campus students. It includes: feed classification, gastrointestinal tract anatomy of domestic mammals, nutrients and their functions, digestion and metabolism, feed regulations, and feeding/nutrition of cattle, small ruminants, horses, swine, poultry, dogs, cats, and rabbits. For on-campus students, ANS 225 counts toward the Animal Science minor but only counts as a Free Elective for Animal Science majors.

ANS 230 Nutrition of Domestic Animals. *4(3-3-0) . F,S. Preq: ANS 150, ANS 205 recommended.* Introduction to nutrition, digestion, and absorption in domestic mammals. Major nutrient classes and their functions in the body, feed classification and chemical analysis, feed processing, and ration formulation to meet nutritional requirements.

ANS (FS, NTR) 301 Introduction to Human Nutrition. *3(3-0-0) . F,S,Sum. Preq: Sophomore standing.* Functions, dietary sources and deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery. Food science majors may use as a free elective only.

ANS 303 Principles of Equine Evaluation. *2(1-3-0) . S. Preq: ANS 110.* Conformation and function, performance, and soundness of the horse. Breed standards, rules, and regulations for evaluation, selection, and performance. Field trips.

ANS 304 Dairy Cattle Evaluation. *2(1-3-0) . S. Preq: ANS 150.* The first half of this course covers basic aspects of dairy cattle breeds, dairy character, form and function including type traits and linear scoring of dairy cattle, interpreting and using judging scorecards, comparing/evaluating dairy cattle, andplacing animals in a class. The second half of the course develops the student's ability to correctly evaluate dairy cattle classes, but more importantly to support their opinions through oral communication.

ANS 306 Equine Behavioral Modification. *3(2-3-0) . F. Preq: ANS 202, SAS Majors or IAS Majors.* Equine behavioral modification (training) of a young horse, including haltering, grooming, learning to overcome fear, ground training, longeing, ground driving, trailering, tacking up, and accepting cues from a rider to make the horse more marketable in preparation for sale. Study of the promotion, sales,and marketing of horses, including legal issues. Departmental Approval Required.

ANS 309 Livestock Evaluation. *3(2-3-0) . S. Preq: ANS 150.* Students will be exposed to basic concepts associated with growth, development and value determination of livestock. Familiarization with official USDA grading standards for cattle, sheep, swine and goats is emphasized. Introduction to judging terminology, placing classes of livestock and justification through oral reasons.

ANS (FS, PO) 322 Muscle Foods and Eggs. *3(2-2-1) . F. Preq: ZO 160,BIO 181,BIO 183, or BIO 125.* Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante- and post-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processedmeat items.

ANS (FS) 324 Milk and Dairy Products. *2(2-0-0) . F. Preq: ZO 160,BIO 181,BIO 183, or BIO 125.* Composition of milk and dairy products, federal standards, raw milk procurement, cleaning and sanitizing and quality attributes.

ANS (FS, PO) 350 Introduction to HACCP. *3(3-0-0) . F,S.* Introductory course on the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants. Offered only as a world wide web course through the Office of Instructional Telecommunications.

ANS 400 Companion Animal Management. *3(2-3-0) . S. Preq: ANS 105 and Junior standing.* Anatomy, physiology, nutrition, genetics, and health of companion animals including cats, dogs, rabbits, rats, mice, reptiles, amphibians, and fish. Problem solving and enterprise management skills in laboratories.

ANS 402 Beef Cattle Management. *3(2-3-0) . S. Preq: ANS 150 and Junior standing.* Principles and practices of production, management and marketing of beef cattle. Role of genetics, nutrition, reproduction and animal health.

ANS 403 Swine Management. *3(2-3-0) . F. Preq: ANS 230 and Junior standing.* Management principles associated with swine production. Emphasis on interactions of health, equipment, nutrition, reproduction and genetics during nursery, finishing, farrowing and breeding phases of production. Waste management practices and alternatives. development of marketing strategies and economic evaluation of management practices.

ANS 404 Dairy Cattle Management. *3(2-3-0) . F, Alt yrs(odd). Preq: ANS 230.* The management of economic, nutritional, genetic, and physiological factors that influence the operation of a dairy enterprise.

ANS 408 Small Ruminant Management. *3(2-3-0) . F Alt.Yrs.(Even). Preq: ANS 150, Junior standing.* Principles and practices of production, management, and marketing of sheep and goats. Role of genetics, nutrition, reproduction and animal health. Hands-on experience and field trips during labs.

ANS 410 Equine Management. *3(2-2-0) . S. Preq: ANS 110 and Junior standing.* Equine anatomy, physiology, nutrition, genetics and health. Laboratory emphasis on reproductive management, breeding, problem solving, and management skills. Field trips required.

ANS (NTR, PO) 415 Comparative Nutrition. *3(3-0-0) . F. Preq: CH 220 or both 221 and 223.* Principles of nutrition, including the classification of

nutrients and the nutrient requirements of and species for health, growth, maintenance and productive functions.

ANS (NTR) 419 Human Nutrition in Health and Disease. *3(3-0-0) . S. Preq: Junior standing. ANS 230, or ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415.* Current concepts regarding, and physiological bases of the roles of nutrition in the prevention and treatment of acute and chronic disease states in humans with emphasis on the process of scientific discovery, reading of original research and transformation of research findings to public policy.

ANS (PO) 425 Feed Mill Management and Feed Formulation. *3(2-3-0) . S. Preq: ANS(NTR,PO) 415 or ANS 230; CH 220 or 221.* Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

ANS 440 Selection of Domestic Animals. *3(2-3-0) . F. Preq: ANS/HS 215 or GN 411, ST 311 or ST/BUS 350.* Modern evaluation and selection procedures for domestic animals; selection goals, estimation of breeding values and performance testing; their impact on genetic changes.

ANS 452 Advanced Reproductive Physiology and Biotechnology. *3(3-0-0) . S, Alt. yrs.(odd). Preq: ANS 220.* Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies.

ANS 453 Growth and Development of Domestic Animals. *3(3-0-0) . F, Alt. yrs.(even). Preq: ANS 230, Junior standing.* Introduction to the basic concepts of growth with emphasis on domestic mammals. Growth of the major classes of animal tissues and regulation by endogenous and exogenous factors. Relationship to efficiency of animal production. Credit will not be given for both ANS 453 and 553.

ANS 454 Lactation, Milk and Nutrition. *3(2-2-0) . S, Alt yrs(even). Preq: ANS 230 or FS/NTR 400; BCH 451 or ZO 421.* Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.

ANS 480 Judging Team. *1(0-3-0) . F. Preq: ANS 303 or ANS 304 or ANS 309.* Students practice judging techniques for livestock, horses, or dairy animals, including ranking animals and providing oral reasons to defend the rankings. Students meet weekly with a coach to practice locally and will also travel to compete in one or two regional or national competitions. Each team (livestock, horse, dairy) is expected to raise funds to finance the trips. Students earn 1 credit for being on a team, and can earn up to 3 credits of Free Elective for ANS 480 by serving on the judging team for different species. Field trips that last several days are required. Departmental Approval Required. Course may be taken up to 3 times (once per species).

ANS 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, and the departmental teaching coordinator prior to the experience.

ANS 493 Special Problems in Animal Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes departmental campus facilities and resources (Arrangements must be initiated by student and approved by a faculty adviser and the departmental teachingscoordinator).

ANS 495 Special Topics in Animal Science. *1-3. F,S,Sum.* Offered as needed to present material not normally available in regular course offerings or for offering of new courses on a trial basis.

ANTHROPOLOGY

ANT 251 Physical Anthropology. *3(3-0-0) . F,S,Sum.* Study of human evolution. Processes of evolution, human variation and race, behavior and morphology of nonhuman primates, and the fossil record. Emphasis on the study of human biosocial adaptation, past and present, and on humans as culture-bearing primates.

ANT 252 Cultural Anthropology. *3(3-0-0) . F,S,Sum.* Comparative study of contemporary human culture, social institutions and processes that influence behavior. The range of human cultural variation shown throughout the world, including the student's own cultural system.

ANT 253 Introduction to Prehistory. *3(3-0-0) . F,S,Sum.* World-wide survey of origins of human society, technology and culture in Old Stone Age, and origins of agriculture, cities, and civilizations of the Bronze and Iron Age in Europe, Asia, Africa, and pre-Columbian Middle and South America.

ANT 254 Language and Culture. *3(3-0-0) . F,S,Sum.* Focus among the aspects of human language and between aspects of language and culture. Topics such as: descriptive and comparative linguistics, structuralism, language and thought, sociolinguistics, bilingualism, culture change and linguistic changes.

ANT (SOC) 261 Technology in Society and Culture. *3(3-0-0) . F,S.* Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks associated with technological innovations. Special attention to the role of scientists and engineers in socio-cultural change. Topical case studies apply course concepts and principles. Core sociological and anthropological concepts, methods, theories.

ANT 295 Special Topics in Anthropology. *1-3. F, S, Sum.* Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

ANT 310 Native Peoples and Cultures of North America. *3(3-0-0) . Preq: ANT 252 or HI 365.* Native North American peoples and cultures including Eskimos and Aleuts. Theories of origin and selected prehistoric cultural manifestations. People and cultures at the time of European contact and post-contact cultural change. Contemporary problems and prospects.

ANT 325 Andean South America. *3(3-0-0) . Preq: ANT 252 or HI 215 or HI 216.* The societies, cultures, politics, economics and ecology of the Andean countries of South America (Peru, Bolivia, Ecuador, Chile, Colombia). Special attention to the development of pre-Columbian Andean Societies.

ANT 330 Peoples and Cultures of Africa. *3(3-0-0) . S. Preq: ANT 252 or HI 275 or HI 276.* African peoples and cultures, especially in sub-Saharan Africa; past and present social patterns of indigenous African populations from a cross-cultural perspective.

ANT 346 Peoples and Cultures of Southeast Asia. *3(3-0-0) . F. Preq: ANT 252.* Southeast Asian peoples and cultures; past and present social patterns of selected mainland and insular Southeast Asian peoples; culture change; relations between minorities and dominant ethnic groups; development of nationalism.

ANT 348 Peoples and Cultures of Italy. *3(3-0-0) . S. Alt. yrs (even). Preq: ANT 252.* Italian peoples and cultures; social institutions in selected regions; social change; regional and national diversity/identities; effects of and responses to immigration.

ANT 370 Introduction to Forensic Anthropology. *3(3-0-0) . F. Preq: ANT 251.* Broad overview of forensic anthropology-an applied field of biological anthropology. Application of the science of biological anthropology to the legal process and humanitarian arena. Identification of skeletal remains to determine age, sex, ancestry, stature, and unique features of a decedent. General identification techniques addressed but proficiency not expected.

ANT 371 Human Variation. *3(3-0-0) . F, Alt. yrs. (odd). Preq: ANT 251.* Survey of basic principles of population genetics with emphasis on mechanisms that shape human biological variation. Analysis of laws of heredity exhibited in modern human populations via microevolution and adaptation. Historical development of concepts with specific application to physical and forensic anthropology. Discussion of most current research.

ANT 373 The Human Fossil Record. *3(3-0-0) . Preq: 3hrs of physical anthropology or archaeology.* Analysis of the human fossil record and consideration of alternate theories of human evolution.

ANT 385 Island Archaeology. *3(3-0-0) . S, Alt. Yr. (odd). Preq: ANT 253.* Exploration of the archaeology of islands. Analysis of the conditions and phenomena surrounding human adaptation to and impact on island environments. Geographic areas include Oceania, Caribbean, Mediterranean, Japan, and the Americas.

ANT 389 Fundamentals of Archaeological Research. *3(3-0-0) . F,Sum, Alt. Yr.(odd). Preq: ANT 253.* Overview of the objectives, field strategies, basics of laboratory analysis, and interpretative approaches to the archaeological record. Analysis and classification of lithics, shell, bone, ceramics, metal, soils, and perishable materials.

ANT 395 Special Topics in Anthropology. *1-3. F, S, Sum. Preq: 3 credits of 200-level Anthropology.* Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

ANT 411 Overview of Anthropological Theory. *3(3-0-0) . S, Alt. yrs.(odd). Preq: ANT 252 and one of the following: ANT 310,325,330 or 346.* A detailed introduction to anthropological theory, interpretive styles and research techniques of major nineteenth and twentieth century anthropologists working within the analytic frameworks of their times, positions espoused by anthropologists in contemporary debates concerning the discipline's future. Students cannot receive credit for both ANT 411 and ANT 511.

ANT 412 Applied Anthropology. *3(3-0-0) . S.* History, aims, methods and ethics of applied anthropology. Anthropological practice in government, industry, community development, education, and medicine. Analysis of consequences of development programs for culture change. Credit cannot be given for both 412 and 512.

ANT 416 Research Methods in Cultural Anthropology. *3(3-0-0) . F, Alt. yrs.. Preq: ANT 252 and one of the following: ANT 310,325,330 or 346.* A systematic overview of cultural anthropological research methods including designing research projects, research techniques, field work methods, and cross-cultural comparison. Reviews relevant ethical questions and anthropologists' reports of their own field work.

ANT 419 Ethnographic Field Methods. *3(2-2-0) . Sum. Preq: Six hours of cultural anthropology.* Ethnographic research methods as part of a summer field school abroad. Topics: research design, participant observation, field note writing, interviewing, sampling, coding, computers in ethnographic research, analysis and ethics.

ANT 420 Biological Bases for Human Social Behavior. *3(3-0-0) . Preq: ANT 251 or 3 hrs. biological sciences.* Applicability of sociobiology to the study of the human condition. Nature and uniqueness of human behavior as compared to the social behavior of nonhuman animals.

ANT 421 Human Osteology. *3(3-0-0) . F, Alt. Yr. (odd). Preq: ANT 251 & any ANT 300 Level.* Survey of all the bones of the human skeleton from an anthropological perspective, including their names, important features useful in recognizing fragmentary specimens from an archaeological context, and techniques for determining the side of the body they come from. Skeletal development and its relationship to skeletal abnormalities. Issues relating to the study of archaeological skeletons.

ANT 424 Bioarchaeology. *3(3-0-0) . F, Alt.Yr.(even). Preq: ANT 421.* Survey of approaches used by bioarchaeologists to understand past lifeways through the study of excavated human remains. Analysis of the ways in which bioarchaeologists reconstruct health and disease patterns, mortality rates, diet, degree of interpersonal violence, and social structure in the human past.

ANT 429 Advanced Methods in Forensic Anthropology. *4(2-4-0) . S, Alt.Yr.(even). Preq: ANT 370, ANT 421.* Advanced methods in forensic anthropology-an applied field of biological anthropology. Application of the science of biological anthropology to the medicolegal process. Identification of skeletal remains to determine age, sex, ancestry, stature, andunique features of a decedent. Analysis of human skeletal remains. Identification techniques addressed and proficiency expected. Students must provide their own transportation to the laboratory site.

ANT 431 Tourism, Culture and Anthropology. *3(3-0-0) . F,Sum. Preq: Three hours of cultural anthropology.* Anthropological approach to tourism studies with emphasis on cross-cultural aspects of international tourism. Attention to impact of mass tourism as compared to alternative tourism; environmental and economic impact of tourism; impact of international tourists and tourism on local communities. Principal theories of leisure in relation to tourism. Theories of culture change in relation to travel and tourism.

ANT (WGS) 444 Cross-Cultural Perspectives on Women. *3(3-0-0) . S, Alt. yrs.. Preq: ANT 252 and one of the following: ANT 310,325,330 or 346.* Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women's statuses and roles. Effect of gender on social position.

ANT 450 Environmental Anthropology. *3(3-0-0) . S, Alt. Yr. (even). Preq: One of the following: ANT 310,325,330 or 346.* Examines the myriad ways that culture serves to mediate the human-environmental equation. Focus is given to different belief systems, subsistence strategies, technological achievements, and policy formulations. Topics covered include cultural ecology, gender and the environment, land tenure, development, ethnoscience and cognitive ecology, subsistence and social organization, historical and political ecology, environmentalism, and environmental policy issues.

ANT 460 Urban Anthropology. *3(3-0-0) . F, Alt. yrs.. Preq: ANT 252 and one of the following: ANT 310,325,330 or 346.* Anthropological study of cities. Examination of cross-cultural patterns of behavior in urban areas and adaptive strategies that urban dwellers employ. Introduction to major theoretical and methodological approaches relevant to an understanding of contemporary urbanization.

ANT 464 Anthropology of Religion. *3(3-0-0) . S, Alt. yrs.(even). Preq: ANT 252 and one of the following: ANT 310,325,330 or 346.* Examination of various anthropological perspectives on the role of religion in social life, and discussion of theoretical and methodological issues pertaining to the study of ritual and belief.

ANT 475 Environmental Archaeology. *3(3-0-0) . F, Alt. Yr. (odd). Preq: ANT 253.* Archaeological investigation of human-environmental interactions. Focuses on various techniques archaeologists and paleoecologists use to reconstruct prehistoric environments. Topics include the analysis of animal remains (e.g., shellfish, fish, marine mammals, birds), soils, and plants, dating techniques, and stable isotopes.

ANT 495 Special Topics in Anthropology. *3(3-0-0) . F,S,Sum.* Detailed investigation of a topic in anthropology. Topic and mode of study determined by faculty member(s).

ANT 496 Anthropology Internship. *6(3-12-0) . S. Preq: ANT 412, ANT 416; Senior standing in Anthropology (B.A.).* Supervised observation and experience in work settings appropriate to anthropological perspectives. Study of the relationships between internship setting and relevant anthropological theory, methods and research. Weekly seminars, individual conferences and an integrative report. Students are responsible for arranging their own transportation to internship sites.

ANT 498 Independent Study in Anthropology. *1-6. F,S,Sum. Preq: Six hours of ANT.* Independent study of a topic in anthropology. Topic and mode of study determined by faculty member(s) and student(s).

ARCHITECTURE

ARC 102 Architectural Design Fundamentals. *6(9-2-0) . S. Preq: DF 101, Undergraduate Architecture Majors. Coreq: ARC 162.* An introduction to architectural design. Analysis of exemplary works of architecture through studies of their functional, material, and perceptual characteristics in drawings and models. Field trips to local buildings and architecture firms.

ARC 140 Experiencing Architecture. *3(3-0-0) . F.* Contemporary and historic houses, public buildings and cities illustrate the practical and aesthetic aspects of architecture. The basic elements of architectural form, design process, and architectural criticism.

ARC 162 An Introduction to Architecture. *3(3-0-0) . S.* The purpose of architecture examined through its practices, theories and key principles. Lectures, projects, and readings expose students to the diverse world of ideas, creative work and practical considerations which make up the discipline of architecture.

ARC 201 Architectural Design: Environment. *6(0-9-0) . S. Preq: DF 102, ARC 141 and ARC 142. Coreq: ARC 211.* Investigation of the relationships between environment and built form. Solar orientation, topography, vegetation, and constructed context in relationship to user needs as parameters for justifying design proposals. Particular emphasis on architectural conventions of communication.

ARC 202 Architectural Design: Form. *6(0-9-0) . S. Preq: ARC 201, ARC 261. Coreq: ARC 252.* Investigation of relationships between idea and form.

Composition and precedent as parameters for generating, developing, and justifying architectural form. Particular emphasis on electronic media in drawing and modeling.

ARC 211 Natural Systems and Architecture. *3(3-0-0) . F. Preq: DF 102.* Restricted to students in BEDA Program. Relationship between natural and architectural systems. Exploration of the implications of natural forces - sun, wind and daylight- on architecture. Energy-conscious architectural design and site planning strategies to fulfill thermal comfort requirements of people in designed environments.

ARC 232 Structures and Materials. *3(2-2-0) . S.* Construction materials related to structural applications. Theory of structures and introduction to quantitative analysis. Implications for design. Historical examples and current practices. Laboratory and field trips required.

ARC 241 History of Architecture. *3(3-0-0) . F.* Introduction to the discipline of architectural history through a study of examples of the built environment (urban planning, buildings, and associated decorative arts) in western and non-western cultures from antiquity to the present day.

ARC 242 History of Western Architecture. *3(3-0-0) . S. Preq: ARC 241.* History of western architecture (including some landscape architecture and city planning) from the beginnings of the Renaissance in early 15th century to late 19th century in the United States.

ARC 251 Digital Representation. *3(2-3-0) . S. Preq: BEDA and M Arch Track 3 student.* Project based methodological investigation of digital representation in architecture including: two- three- and four-dimensional media. Purchase of laptop and necessary software required.

ARC 252 Architectural Design Methods. *3(3-0-0) . S. Preq: DF 102.* A comprehensive survey of methods for conceiving, developing, justifying, and evaluating architectural form from historical, cultural, social, technical and aesthetic perspectives.

ARC 253 Architectural Communication. *3(2-2-0) . F,S. Preq: DF 102 or Graduate standing in Architecture.* Basic graphic communication skills in architecture. Emphasis on the use of drawing as a path to better design and on the communication of architectural ideas.

ARC 261 The Discipline of Architecture. *3(3-0-0) . F.* The modern architecture profession in the U.S. Emphasis on historical events and intellectual, technological, and esthetic developments here and abroad which have shaped today's profession. Concepts of professionalism and ethics, legal and institutional foundations, and case studies of professional roles in architecture.

ARC 289 Architectural Travel Study I. *3(3-0-6) . F,S,Sum. Preq: ARC 141 and ARC 142.* The study of cities, architectural sites, buildings, building complexes, and architectural elements conducted independently by students as part of a planned travel-study tour. Includes advance research and approval of proposed study topic and itinerary. Students will document study through sketches, analytical notations, and a summary paper. Departmental Approval Required

ARC 292 Special Topics in Architecture. *1-3. F,S,Sum. Preq: Consent of Instructor.* Topics of current interest in Architecture. Normally used to develop new courses.

ARC 301 Architectural Design: Intermediate. *6(0-9-0) . F. Preq: ARC 202; Bachelor of Environmental Design (EDA) Majors of Junior studio Standing.* Studies in architectural design. Projects of many types and scales are employed to investigate issues in architecture. Emphasis is on independent exploration of design values and their implications.

ARC 302 Architectural Design: Technology. *6(0-9-0) . S. Preq: Bachelor of Environmental Design in Architecture majors; ARC 301, ARC 331. Coreq: ARC 332, ARC 414.* An investigation of technical systems of building - structure, environmental control/energy, materials, enclosure, and circulation, their fabrication and assembly and their capacity to affect form and tectonic structure- as fundamental elements of the design process. Particular emphasis on physical models.

ARC 331 Architectural Structures I. *3(2-2-0) . F. Preq: ARC 232.* Structural design process. Combined role of imposed loads and architectural function in shaping the form of the building. Interaction of elements in structural systems containing beams, columns, trusses, space frames, slabs, arches, vaults, domes,cables, cable networks, fabrics and diaphrams. Case studies emphasized.

ARC 332 Architectural Structures II. *3(2-2-0) . S. Preq: ARC 331.* Structural systems explored through case studies and design projects. Emphasis on interaction of structural elements. Tracing of loads in structural systems. Sizing of tensile elements, columns, trusses, and flexural elements. Design and sizing of joints.

ARC 401 Architectural Design: Urban. *6(0-0-9) . F. Preq: Bachelor of Environmental Design (EDA) Majors, ARC 302.* An architectural design studio intended to explore and integrate design issues of all types within an urban environment. Emphasis will be placed on both formal and technical issues of urban sites including transportation and land use planning, phasing of projects over time, relationships to other structures, and the application of development codes, regulations, and urban design principles to the fabric of the city.

ARC 402 Architectural Design: Advanced. *6(0-9-0) . S. Preq: Bachelor of Environmental Design (EDA) Majors, ARC 401.* Advanced architectural design studios in which projects of many types and scales are employed to investigate a range of educational, theoretical and professional studies. Particular emphasis on independent research and exploration of design issues and their implications as defined by faculty.

ARC 403 Architectural Design Fundamentals: Environment. *6(0-12-0) . F. Preq: M. Arch Track 3 student. Coreq: ARC 211.* An introductory architectural design studio for M. Arch, Track 3 students investigating the relationship between environment and built form. Solar orientation, climate, topography, vegetation, and constructed context in relationship to user needs as parameters for design proposals. Particular emphasis on design fundamentals and conventions of architectural communication.

ARC 404 Architectural Design Fundamentals: Form. *6(0-12-0) . S. Preq: M. Arch Track 3 student, ARC 403, ARC 252. Coreq: ARC 261.* An introductory architectural design studio for M. Arch. Track 3 students investigating relationships between idea and form. Composition and precedent as parameters for generating, developing, and justifying architectural form. Particular emphasison electronic media in drawing and modeling.

ARC 405 Architectural Design Fundamentals: Technology. *6(0-12-0) . S. Preq: M. Arch Track 3 student, ARC 404. Coreq: ARC 331.* An introductory architectural design studio for M. Arch. Track 3 students in which the technical systems of building - structure, environmental control/energy, materials, enclosure, and circulation; their fabrication and assembly; and their capacityto affect form and tectonic expression - are explored as fundamental elements of the design process. Particular emphasis on physical models.

ARC 406 Architectural Design Fundamentals: Integration. *6(0-12-0) . S. Preq: M. Arch Track 3 student, ARC 405. Coreq: ARC 332, ARC 414, ARC 441.* An introductory architectural design studio for M. Arch. Track 3 students involving the execution of a project in sufficient depth to understand the opportunities and discipline resulting from the inclusion of building technologies, the elaboration of interior space, and the development, representation, and communication of details at a large scale.

ARC 414 Environmental Control Systems. *3(3-0-0) . S. Preq: ARC 211, Junior standing.* Studies in light, heat, moisture, air motion, and sound in architectural environments. Mechanical, electrical and/or electronic equipment for illumination, heating, cooling, ventilation, vertical transportation and communication in buildings. Water and waste, fire protection and safety, and acoustic systems in architecture.

ARC 432 Architectural Construction Systems. *3(2-3-0) . F. Preq: ARC 232.* Building construction systems related to architectural design. Historical and current building practices. Implications for design and systems selection. Case studies. Field trips are required.

ARC 441 History of Contemporary Architecture. *3(3-0-0) . F. Preq: Junior standing or ARC 141 or 142.* A survey and critical examination of modern architecture from its origins in 19th-century philosophy and technology to the most recent developments in world architecture.

ARC 442 History of NC Architecture. *3(3-0-0) . S. Preq: ARC 141,142, Junior standing in COD.* Survey of NC Architecture from 17th-century settlement to World War II. Coverage of a wide range of building types and development patterns.

ARC 445 Aesthetics and Design. *3(3-0-0) . S. Preq: ARC 141 or 142.* An examination of the identity, nature, and function of aesthetic experience, cognition and action as related to the design disciplines and reflected in designed artifacts.

ARC 450 Architectural Drawing. *3(2-3-0) . F. Preq: M Arch Track 3 student.* Introduction to freehand and constructed drawing including planimetric drawing and three-dimensional techniques of axonometric, isometric, and perspective. Freehand on-site drawing in various media and the art of the design sketch. Basics of visual composition and diagramming.

ARC 490 Architecture International Studio. *6(0-9-0) . F,S,Sum. Preq: ARC 202.* Exploration of architectural problems and development of design solutions in an international setting. Studio projects focused on current conditions found in the host culture, profession, and community.

ARC 492 Special Topics in Architecture. *1-3. F,S,Sum.* Topics of current interest in Architecture. Normally used to develop new courses.

ARC 495 Independent Study in Architecture. *1-3. F,S,Sum. Preq: 3.0 Junior standing in Architecture GPA or better; and Departmental approval required.* Special projects in architecture developed under the direction of a faculty member on a tutorial basis.

AGRICULTURAL AND RESOURCE ECONOMICS

ARE 201 Introduction to Agricultural & Resource Economics. *3(3-0-0) . F,S. Preq: MA 111.* Introduction to economic principles of marginal benefits and costs with application to consumer and producer decisions. Functions of market exchange systems in determining prices and quantities and creation of wealth. Property rights and opportunities for exchange. Role of government in dealing with agricultural and resource problems. Macroeconomic analysis including inflation, unemployment, money and banking system. Credit will not be given for both EC 205 and either EC 201 or ARE 201.

ARE 210 Consumer Economics. *3(3-0-0) . S.* Role of the consumer in the modern economy and application of economic concepts to consumer markets and decisions. Economic analysis of home buying and home finance, credit, life, health, and property insurance, investments, retirement planning, and information collection. Relationship of the macroeconomy to consumer decisions.

ARE 215 Small Business Accounting. *3(2-2-0) . F. Preq: ARE 201 or EC 201 or EC 205.* Record keeping for small businesses organized as sole proprietorships, partnerships, and family held corporations. Double entry accounting principals applied to service and merchandising businesses. General Journals, Combination Journals, Subsidiary Journals, Ledgers, Accounts Receivable, Accounts Payable, Posting, Worksheets. Financial Statements, Closing, Payrolls, Cost Basis, Depreciation, Section 179, Amortization, Financial Adjustments, and Income Tax Forms. Both manual and computerized systems. Semester project of keeping records for a business for a portion of the year.

ARE 301 Intermediate Microeconomics. *3(3-0-0) . F,S,Sum. Preq: MA 121 or 131; ARE 201 or EC 205 or EC 201.* Functioning of the market economy: role of prices in determining the allocation of resources; the functioning of the firm in the economy; forces governing the production and consumption of economic goods. Credit not allowed for both EC(ARE)301 and EC(ARE) 401.

ARE 303 Farm Management. *3(2-2-0) . F,S. Preq: ARE 201 or EC 201.* Analytical and planning techniques for making business decisions centered around farm business applications. Economic principles and management concepts such as budgeting, accounting, finance credit, investment analysis, business organization, risk,and taxes as related to practical problems of operating a farm business.

ARE 304 Agribusiness Management. *3(3-0-0) . S. Preq: ARE 201 or EC 201.* Management decision-making by food, fiber, horticulture, and forestry firms. Emphasis on current agribusiness topics such as information utilization, strategic planning, organization structures, competitor intelligence, pricing, leadership, crisis management, ethics, and human resource management. Business communications, agribusiness case studies, and a computerized management simulation game.

ARE 306 Agricultural Law. *3(3-0-0) . F,S. Preq: ARE 201 or EC 201.* Legal principles of practical importance in an agricultural setting: the court system; tort, contract and real and personal property law; legal aspects of organizing an agribusiness; environmental and labor regulations affecting agriculture; income and estate taxation of agriculture. Credit for both ARE 306 and BUS 307 is not allowed

ARE 309 Environmental Law & Economic Policy. *3(3-0-0) . F. Preq: ARE 201 or EC 201.* Current federal and state environmental laws and regulations and their common law foundations. Relationship of the law and its regulatory mechanisms to economic policy issues: externalities, pollution taxes, incentives, permit trading, and cost-benefit analysis. Major environmental topics including water and wetlands, solid and hazardous wastes, pesticides, clean air, endangered species and nuisance actions. Overview of the legal system.

ARE 311 Agricultural Markets. *3(3-0-0) . F,S. Preq: ARE 201 or EC 201.* Agricultural marketing system and economic forces affecting its structure and efficiency. Public policy issues affecting agricultural markets. Emphasis on the analysis of current sources of agricultural market information. Marketing and storage problems over time; futures markets and the management of risk; transportation and international trade; government agricultural programs.

ARE 312 Agribusiness Marketing. *3(3-0-0) . S. Preq: ARE 201 or EC 201.* Application of marketing and economic principles to decision making in contemporary agribusiness firms. Marketing strategies, marketing research and information, segmentation and targeting, marketing mix, and market plans within food, fiber, natural resource, and production input industries. Professional selling skills and knowledge. Off-campus field experience and visiting lecturers from the agribusiness industry.

ARE 321 Agricultural Financial Management. *3(3-0-0) . F. Preq: ARE 201 or EC 201.* Fundamental concepts for financial management decision in agricultural/farm businesses. Emphasis on financial statement analysis of profitability, efficiency, liquidity, repayment capacity, risk, leverage, growth. Capital budgeting, investment decisions, farmland bid price determination, farm real estate appraisal. Financial markets and credit institutions serving agriculture, lending policies, loan analysis, interest rate determination. Financial structure, performance, condition of farm sector.

ARE 332 Human Resource Management for Agribusiness. *3(3-0-0) . F. Preq: ARE 201 or EC 201 or EC 205.* General introduction to human resource management in agribusinesses. Skills for agribusiness owners for efficient productivity from employees in a legal and ethical manner. Topics on labor economics, human resource legislation, employee planning andrecruitment, and migrant labor issues. Emphasis on techniques for training, motivating, leading, and disciplining employees.

ARE (EC) 336 Introduction to Resource and Environmental Economics. *3(3-0-0) . S. Preq: ARE 201 or EC 201 or EC 205.* Application of basic economic tools to understand and evaluate environmental/resource policies. Concepts such as property rights, non-market goods, allocation over time, externalities, and public goods. Current policy issues such as global climatechange, evaluating natural resource damages from oil spills, reducing the costs of regulations, protecting estuaries, and dealing with non-point source pollution.

ARE (EC) 401 Economic Analysis for Non-Majors. *3(3-0-0) . F,S. Preq: ARE 201 or EC 205 or EC 201.* Intermediate economic theory of firm, household, and market behavior. Demand, production and cost theory, market equilibrium under competitive and non-competitive conditions, and problems of economic efficiency. Not open to undergraduates majoring in the Department of Agricultural and Resource Economics or the College of Management. Credit not allowed for both ARE(EC) 301 and 401.

ARE 403 Economics of Consumer Decisions. *3(3-0-0) . Alt. yrs. Preq: ARE 201 or EC 201.* Application of economic theory of the consumer to lifetime personal resource allocation decisions intended for non-major graduate students at the master's level. Emphasis on dynamic considerations in consumption and saving, replacement of consumer durables, and evaluation of consumer protection policies. Not open to undergraduates majoring in the Department of Agricultural and Resource Economics or the College of Management. Credit not allowed for both ARE 210 and ARE 403

ARE 412 Marketing Analysis and Plans for Agribusiness and Life Sciences. *3(3-0-0) . F. Preq: ARE 312 or BUS 360; and ST 311 or BUS/ST 350.* ARE 412 uses step-by-step marketing plan development for agribusiness, agricultural, and/or life sciences products. Student groups research, develop, and present a written market plan. The course focuses on collection and analysis

of information pertaining to a product's environment, customers, and competitors. An integrative course, ARE 412 brings together concepts learned in marketing, finance, management, law and policy areas.

ARE 423 Futures and Options Markets. *3(2-2-0) . S. Preq: ARE(EC) 301 and ARE 311 or BUS 320.* Operation and business uses of futures and options markets. Emphasis on market institutions, arbitrage price relationships, risk analysis, hedging theory and practice, portfolio evaluation and market regulation. Similarities among commodity, bond and stock index futures emphasized.

ARE 433 U.S. Agricultural Policy. *3(3-0-0) . S. Preq: ARE(EC) 301 or ARE(EC) 401.* Government economic policies and programs affecting agricultural inputs and farm products. Analysis of the rationale, objectives, and major types of agricultural programs and their effects on resource allocation and income distribution within agriculture and between agriculture and the rest of the economy.

ARE (EC) 436 Environmental Economics. *3(3-0-0) . S. Preq: ARE(EC) 301.* Usefulness of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations, marketable permits and subsidies considered in designing alterations in the incentive system. Current public policy alternatives in the context of non-market decision-making.

ARE 490 Career Seminar in Agriculture & Resource Economics. *1(1-0-0) . F. Preq: Junior standing.* Planning and preparing for career choices. Resume writing, networking, interviewing, personality characteristics, and job searching. Visits with employer representatives. Employer expectations and career opportunities. Researching firms and employment opportunities. Oral and written presentations.

ARE 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ARE 493 Special Problems/Research Exploration. *1-6. F,S. Preq: ARE Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ARE 495 Special Topics in Agricultural and Resource Economics. *1-6. Preq: Departmental approval required.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis.

ARTS STUDIES

ARS 233 Makeup Design for the Stage. *3(3-0-1) . F.* The process of design and application of makeup for the stage including techniques for character and age makeup, making and applying facial hair and other specialized techniques. Taught from the play script to production with emphasis on historical research, play analysis, and applications techniques. The course includes hands-on experience with makeup. May not be taken concurrently with ARS 236 or ARS 333. May not be taken concurrently with ARS 236 or ARS 333

ARS 236 Text to Stage. *3(3-0-1) . F, S.* Study of script preparation beginning with the directors' and designers' collaborative efforts through rehearsal process, to the production itself and ending with the final evaluation. Directors' methods and designer processes in theory and practice. Attendance at one rehearsal and two productions is required. May not be taken concurrently with ARS 233 or 333. May not be taken concurrently with ARS 233 or ARS 333

ARS 251 The Arts of a World Capital: London. *3(3-0-0) . Sum.* Multidisciplinary course introducing students to the architecture and museums and the musical, dance, and theatrical performances of London. Historical and social context of these works of art. The infrastructure in London that makes its unusual artistic vitality and quality possible. Taught in London.

ARS 252 The Arts of Vienna 1900. *3(3-0-0) . Sum.* Interdisciplinary study of art, architecture, music and theater in turn-of-the-century Vienna and of the political and scientific thinking that surrounded these arts. Taught in Vienna.

ARS 253 Arts of NC State. *3(3-0-0) . F, S.* Study of the arts in the context of the university community, utilizing university arts programs and resources. Core concepts and methods for aesthetic experience in several disciplines including dance, theater, music, visual art, and craft through performance and exhibition attendance, readings, lectures, and discussion. (Modest fees for performance tickets might be required.)

ARS (STS) 257 Technology in the Arts. *3(3-0-0) . F.* The interaction between technology and the arts with an emphasis on developments in Western art of the twentieth century. Historical and emerging issues include: sound and film recordings, the addition of sound to films, the impact of films and television on theater, the impact of radio, computer applications to music, the visual arts, and literature.

ARS 258 Mathematics and Models in Music. *3(3-0-0) . S.* Use of mathematics and models in the composition of western music of various time periods with an emphasis on the twentieth century. Critical analysis of trivial and non-trivial uses of mathematics; differentiation between mathematics as an analytical tool and mathematics as a compositional tool. Survey of models including geographical, grammatical, and graphic.

ARS 259 The Arts and Politics. *3(3-0-0) . F.* Interactions between the arts and politics. Specific instances and types of political art from the past and the present. Patronage, censorship, propaganda, art in times of war, the artist's options and powers, aesthetics and criticism.

ARS (MUS) 306 Music Composition with Computers. *3(3-0-0) . F, S, Sum. Prvq: Some knowledge of music or computer science (e.g. CSC 200).* Survey of the theory and history of computer music, compositional algorithms, digital synthesis techniques, composition of at least one computer music work -- a computer-assisted composition for traditional instruments, a piece for computer music ontape, a real-time piece, or a piece that combines tape and instrument(s).

ARS 333 Costume Design and Technology. *3(0-0-0) . S. Preq: COM 103 or ARS 236.* The process of designing costumes taught from the perspective of both the play's script and the anticipated production with emphasis on historical research, play analysis, rendering technique, and basic construction. Hands-on experience required. May not be taken concurrently with ARS 233 or ARS 236. May not be taken concurrently with ARS 233 or ARS 236.

ARS (AFS) 346 Black Popular Culture. *3(3-0-0) . F, S, Sum.* A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse.

ARS 351 Arts, Ideas and Values. *3(3-0-0) . F.* An examination of the way works of art embody a particular understanding of what is real and what is worthwhile and shape their viewers' ideas and values. Case studies approach.

ARS 352 Dress, Style and Change. *3(3-0-0) . S. Preq: Junior standing.* Interdisciplinary course focusing on historical and cultural principles of style as related to dress and fashion. Examination of fashion and stylistic trends in cycles of dress.

ARS 353 Arts and Cross-Cultural Contacts. *3(3-0-0) . S.* Study of works of art that allude to or combine two or more traditions. Examples from film, dance, music, theater and visual arts. Analysis of the role of the exotic in art. The role of arts of multiple traditions in inaugurating new artistic movements, such as Ming landscape painting. Impact of electronic media on contemporary multicultural arts, such as Nepali pop.

ARS 354 The Arts and the Sacred. *3(3-0-0) . S, (ALTYRODD).* The support and critique of religion through the arts. Study of religious symbolism embodied in works of art from a number of traditions and genres. The interrelationship between art and religion, history, culture, spirituality, and ritual.

ARS 433 Period Styles in Acting. *3(3-0-0) . S. Preq: COM 493.* Interpreting daily lives in earlier eras through reading, discussion, research, and performance. Plays of complex heightened language, in verse and prose, studied from perspective of character's daily lives and their relevance to contemporary performance skills. Scenes, monologues, and soliloquies rehearsed and performed.

ARS 494 Topics in Arts Studies. *3(3-0-0) . F,S. Preq: Junior standing and 15 hours in either dance, design, film studies, music, theater, or visual arts.*, Multi-arts course focusing on selected works of art in various media, related by theme, place or data. Capstone course for students with an extensive background in one of the arts. Topics may vary.

ARS 498 Independent Study in Arts Studies. *1-3. F,S,Sun. Preq: Nine hours of course work in Arts Studies and Departmental approval required.* Independent study or project directed by a faculty member in the student's area of interest.

AEROSPACE STUDIES

AS 121 The Foundation of the United States Air Force I. *1(1-0-0) . F.* Part I of a survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions and organization of the Air Force.

AS 122 The Foundations of the United States Air Force II. *1(1-0-0) . S.* Part II of a survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions and organization of the Air Force.

AS 221 The Evolution of USAF Air and Space Power I. *1(1-0-0) . F.* Part I of a course featuring topics on Air Force heritage and leaders; introduction to air and space power through examination of competencies and functions; and continued application of communication skills. Its purpose is to instill an appreciation of the development and employment of air power and to motivate students to transition from AFROTC cadet to Air Force ROTC officer candidate.

AS 222 The Evolution of USAF Air and Space Power II. *1(1-0-0) . S.* Part II of a course featuring topics on Air Force heritage and leaders; introduction to air and space power through examination of competencies and functions; and continued application of communication skills. Its purpose is to instill an appreciation of the development and employment of air power and to motivate students to transition from AFROTC cadet to Air Force ROTC officer candidate.

AS 321 Air Force Leadership Studies I. *3(3-0-0) . F. Preq: Successful completion of Field Training.* Part I of a course that teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is place on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.

AS 322 Air Force Leadership Studies II. *3(3-0-0) . S. Preq: Successful completion of Field Training.* Part II of a course that teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is placed on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.

AS 421 National Security Affairs/Preparation for Active Duty I. *3(3-0-0) . F. Preq: Successful completion of Field Training.* Part I of a course designed for college seniors and that gives them the foundation to understand their role as military officers in American society. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.

AS 422 National Security Affairs/Preparation for Active Duty II. *3(3-0-0) . S. Preq: Successful completion of Field Training.* Part II of a course designed for college seniors and that gives them the foundation to understand their role as military officers in American society. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.

AS 495 Special Topics in Aerospace Studies. *2(2-0-0) . F,S. Preq: Consent of Instructor.* Offered as needed to treat new or special subject matter relating to the Department of the Air Force.

BIOLOGICAL AND AGRICULTURAL ENGINEERING

BAE 100 Introduction to Biological Engineering. *1(0-2-0) . S.* Technical topics and career options in Biological Engineering with concentrations in Agricultural, Bioprocess, and Environmental Engineering are introduced. Information is provided about career services, internships, and study abroad and co-op opportunities in these areas. Students develop a plan of work.

BAE 200 Computer Methods in Biological Engineering. *2(1-2-0) . F. Preq: MA 141 and E 115.* Students develop computer-based problem solving techniques to solve introductory problems in Biological and Biomedical Engineering. Emphasis is on developing solution algorithms and implementing these with spreadsheets, equation solvers, and computer programming.

BAE 201 Shop Processes and Management. *3(2-3-0) . F,S.* Safety practices, materials, equipment, processes, procedures, and management techniques related to operation and maintenance of a mechanized agricultural enterprise or agriculture-related industry. Theory and practice through basic shop operationsand procedures.

BAE 202 Introduction to Biological and Agricultural Engineering Methods. *4(2-4-4) . S. Preq: BAE 200.* Introduction to experimental design methodology, basic engineering design and problem solving methology for Biological Engineering. Visualization skills, computer-aided 3-D solid modeling of parts, 3-D assembly of solid part geometries, computation of mass properties, 2-D engineering drawings, engineering design process, safety, tools and fabrication processes and design, and hands-on shop fabrication of semester project.

BAE 311 Agricultural Machinery and Power Units. *4(3-3-0) . S. Preq: CH 101, CH 102 and PY 211 or PY 131.* Agricultural machinery principles, energy requirements, operation, calibration and environmental considerations. Diesel engine principles and their application to engine power, efficiencies and systems. Power trains and hydraulic systems. Application of basic machinery and power principles to mechanical needs in environmental systems.

BAE 315 Properties of Biological Engineering Materials. *3(2-2-0) . S. Preq: PY 208, BIO 125 or BIO 183 or ZO 160. Coreq: MAE 308 or CE 382 and MAE 314 or CE 313.* Physical properties of biological and non-biological engineering materials, their uniqueness and variability within systems. Relationships between plant, animal, and human tissues, property measurement, and evaluation of dimensional, mechanical, rheological, thermal, electrical, and optical properties.

BAE (SSC) 323 Water Management. *3(2-2-0) . F. Preq: Junior standing.* Water management principles applied to small watersheds. Hydrologic cycle; runoff; erosion control; soil-water-plant relationships; surface and subsurface drainage; surface, sprinkler, and microirrigation; vegetative waterways and open channel flow; impoundments; wetlands; water quality and supply; water rights. Emphasis on concepts, quantification, and systems approach.

BAE (SSC) 324 Elementary Surveying. *1(0-3-0) . F. Preq: Junior standing.* Theory and practice of plane surveying to include measuring distances as well as record keeping, differential leveling, profile leveling, topographic mapping, stadia surveying, and the use of these tools in agricultural applications.

BAE 325 Introductory Geomatics. *3(2-3-0) . F. Preq: Sophomore standing in COE, or Junior standing in CALS or CNR.* Theory and practice of plane and satellite-based surveying. Includes distance measurement, differential leveling, profile leveling, topographic surveying, and record keeping. Introduction to tapes, levels, total stations, surveying software, the global positioning system, GPS receivers and methods (stand-alone, DGPS, RTK), data collection, data processing, and applications.

BAE 332 Animal Facilities and Environmental Management. *4(3-3-0) . S. Preq: PY 211 or PY 131.* Environmental relationships, design methods, materials and construction procedures as they relate to agricultural animal production facilities. Problem situations integrating structural design, environmental control, and waste handling.

BAE 333 Processing Agricultural Products. *4(3-3-0) . S. Preq: PY 212.* Application of the principles of fluid flow, heat transfer, refrigeration, psychrometrics, and materials handling to the processing of agricultural

products. Pump sizing, heat exchanger selection, refrigeration analyses, fan sizing, crop drying, andselection of materials handling equipment.

BAE 343 Agricultural Electrification. *3(3-0-0) . F. Coreq: PY 212.* Practical and efficient use of electrical energy for agricultural and home application. Energy conservation, electric rates, farm and house wiring, circuit design, single-phase and three-phase distribution systems, electric motors, lighting, space and water heating, electric controls, safety and protective devices.

BAE 344 Circuits and Controls. *1(0-3-0) . F. Coreq: PY 212; BAE 343 or ECE 211.* Applied laboratory covering energy conservation, farm and home wiring, circuit design, single-phase and three-phase distribution systems, electric motors, lighting, heating, electric controls, safety and protective devices, and home water systems.

BAE 361 Analytical Methods in Engineering Design. *3(2-2-0) . S. Preq: BAE 101, CE 215 or MAE 208, MA 341. Coreq: MAE 314.* Engineering problem solving through studies of topics in engineering design. Kinematic analysis of linkages, analysis and design/selection of machine structures and power transmission components, including vibration modeling and control in lumped mass mechanical and biomechanical systems.

BAE 401 Instrumentation for Biological Systems. *3(2-3-0) . F. Preq: ECE 331.* Basic concepts of instrumentation for monitoring of biological systems. Study of transducers and circuits utilized in biological and agricultural engineering applications. Demonstration of concepts of error, accuracy and precision, linearity and other instrument characteristics by electronic models. Provision of hands-on experience for reinforcing lecture concepts in laboratories. Credit will not be given for both BAE 401 and BAE 501.

BAE 402 Transport Phenomena. *3(2-2-0) . F. Preq: MA 341; MAE 301. Coreq: CE 382 or MAE 308.* Theory and application of heat and mass transfer in biological, food, and agricultural systems. Topics include fluid flow, conduction, convection, radiation, psychrometrics, and refrigeration.

BAE 422 Introduction to Food Process Engineering. *3(2-0-2) . S. Preq: BAE 402; MAE 308 or CE 382; MAE 301 or CHE 315.* Introductory principles and practices of handling and preserving food products. Coverage includes the design and analysis of handling systems for discrete and continuous flow material handling systems, the selection and specification of automatic controls, food preservation principles and considerations relevant to the design of food handling systems, and the principles and practices of drying and storing grain.

BAE (BBS) 425 Industrial Microbiology and Bioprocessing. *3(3-0-0) . S. Preq: Junior or higher standing in CALS or COE; MB 351.* Introduction to the structure and functions of microbial cells and their cultivation and utilization in bioprocess engineering. Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels, industrial chemicals, pharmaceuticals, food additives and food products such as beer, wine, cheese and yogurt Microbial biomass production. Introduction to environmental biotechnology including waste water treatment, bioremediation and biomining. Biodeterioration and its control. Product development, regulations and safety. Field trip(s) are an essential educational component of the course and are required. Credit will not be given for both BAE(BBS) 425 and BAE 525.

BAE 432 Agricultural and Environmental Safety and Health. *3(3-0-0) . F. Preq: Junior standing and 6 hrs CALS Group A, B or C Electives.* Safety and health issues for agricultural and environmental occupations. Hazard recognition, injury and illness prevention, regulations, and safety and health management strategies for agricultural production, chemical handling, and waste management. Environmental factors which affect human health and safety.

BAE (SSC) 435 Precision Agriculture Technology. *3(2-3-0) . S. Alt. yrs(even). Preq: Junior standing or Senior standing.* Overview of technology available for implementation of a comprehensive precision agriculture program. Topics include computers, GPS, sensors, mechanized soil sampling, variable rate control system, yield monitors, and postharvest processing controls. Applications of precision agriculture in crop planning, tillage, planting, chemical applications, harvesting and postharvest processing. Credit may not be received for BAE/SSC 435 and BAE/SSC 535.

BAE (CS, SSC) 440 Geographic Information Systems in Production Agriculture. *3(2-2-0) . S. Preq: SSC 341.* Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

BAE 442 Systems Approach to Agricultural and Environmental Issues. *3(3-0-0) . S. Preq: ENG 331 or ENG 332 or ENG 333; Senior standing.* Systems approach to complex agricultural and environmental issues and problematic situations including people's views. Multiple stages of soft systems approach: open inquiry into and description of issues, conceptual modeling, feasibility and implementation of changes. Individual project using systems approach to a complex issue in agriculture or the environment.

BAE 451 Engineering Design I. *3(2-2-0) . F. Preq: BAE 202 and 3 of the following courses (BAE 315, 361, 401, 402, 422, 425, 471, 472, or 481..* Design concepts of engineering problems; objectives, specifications, manufacturing, prior art and analysis. Oral and written exercises in reverse engineering, national and international standards, quality control, intellectual law and engineering ethics. Team projects from agricultural, biomedical, bioprocessing and environmental engineering. Must be within 36 credit hours of completing the BE degree.

BAE 452 Engineering Design II. *3(2-2-0) . S. Preq: BAE 451.* Continuation of BAE 451; Project analysis, design, scheduling, construction, tests and reports. Teamwork and the function of engineering design in society.

BAE 462 Machinery Design and Applications. *3(2-3-0) . S. Preq: BAE 361.* Machinery design for effective use of energy and labor in agricultural production. Engine cycles, power transmission, hydraulics, traction, combined stresses, finite element analysis, computer-aided-engineering, and engineering economics. Machinerydesign of agricultural field equipment and other agricultural machinery systems.

BAE 471 Land Resources Environmental Engineering. *3(2-2-0) . F. Preq: SSC 200. Coreq: SSC 200 and CE 382 or MAE 308.* Hydrology and erosion principles. Designing structures and selecting practices to control land runoff, erosion, sediment pollution and flooding.

BAE 472 Irrigation and Drainage. *3(3-0-0) . S. Preq: SSC 200, BAE 471.* Design, management and evaluation of irrigation and drainage systems; concepts and processes of system design. Credit will not be given for both BAE 472 and BAE 572.

BAE 473 Introduction to Surface/Water Quality Modeling. *3(2-0-2) . S. Preq: BAE 471 and SSC 200.* Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic/water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.

BAE 481 Structures & Environment. *3(2-3-0) . S. Preq: BAE 402; CE 313 or MAE 314.* Principles of environmental control and structural analysis are combined with biological principles for the design of structures. Topics include structural analysis, load estimation, material selection, fasteners, physiological reactions of animalsand plants to their environment, applications of heat transfer and psychrometrics in calculating ventilation requirements, heating or cooling loads.

BAE 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BAE 493 Special Problems in Biological and Agricultural Engineering. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BAE 495 Special Topics in Biological and Agricultural Engineering. *1-3. F,S,Sun. Preq: Consent of Instructor.* Offered as needed for presenting material not normally available in regular BAE departmental courses or for new BAE courses on a trial basis.

BIOPROCESSING SCIENCE

BBS 201 Introduction to Biopharmaceutical Science. *3(3-0-0) . S.* Through this course, students will experience laboratory and manufacturing terminology relevant to the biomanufacturing industries. Students will also gain exposure to regulatory and compliance procedures and issues facing this industry. This coursewill provide an introduction to prepare students to meet the demands and expectations of this industry and the bioprocessing science program.

BBS 301 Process Validation Science. *3(3-0-0) . F. Preq: ST 311, FS 231, CH 201, CH 202, MB 351, and BCH 451.* Process validation is a tested and documented subset of the panel of activities that are performed during the production of a biopharmaceutical. This course will introduce the concept of process validation as it applies to the biotechnology industry, and more specifically, to the manufacture of protein molecules as therapeutic agents.

BBS (BAE) 425 Industrial Microbiology and Bioprocessing. *3(3-0-0) . S. Preq: Junior or higher standing in CALS or COE; MB 351.* Introduction to the structure and functions of microbial cells and their cultivation and utilization in bioprocess engineering. Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels, industrial chemicals, pharmaceuticals, food additives and food products such as beer, wine, cheese and yogurt Microbial biomass production. Introduction to environmental biotechnology including waste water treatment, bioremediation and biomining. Biodeterioration and its control. Product development, regulations and safety. Field trip(s) are an essential educational component of the course and are required. Credit will not be given for both BAE(BBS) 425 and BAE 525.

BBS 426 Industrial Microbiology & Biomanufacturing Laboratory. *2(0-6-0) . F. Preq: MB 351 and MB 352. Coreq: BBS/BAE 425.* This course is designed as the laboratory complement to BBS/BAE 425, and will provide students hands-on experiences with key microbiological techniques and processes used by biomanufacturing industries. Specific areas of focus will include fermentation technology, separation methods, and enzyme kinetics.

BIOCHEMISTRY

BCH 150 Introductory Biochemical Concepts. *2(2-0-0) . S. Preq: Freshman standing or Sophomore standing in BCH. Coreq: CH 101.* An introduction to concepts and perspectives in biochemistry, designed to provide students with an overview of biology at the molecular level.

BCH 220 Role of Biotechnology in Society. *3(10-0-0) . SUM1, SUM2. Preq: BIO 181, CH 101.* Biotechnology and Societing is an introductory science course that takes a semi-technical look at the emerging role of biotechnology in human society. Expectations are that students will gain an appreciation for biotechnology, the ability to understand how biotechnology works. Offered only in Poland through Study Abroad (4-week course). Departmental approval required.

BCH 451 Principles of Biochemistry. *4(3-0-1) . F,S,Sum. Preq: CH 223.* Introduction to the fundamental principles of biochemistry. Emphasis on biochemical structures, properties, functions and interactions, including enzyme kinetics and central pathways of metabolism.

BCH 452 Introductory Biochemistry Laboratory. *2(1-3-0) . F,S. Coreq: BCH 451.* Laboratory experience to complement BCH 451. Basic skills in the use of volumetric equipment, spectrophotometers, chromatography, and electrophoresis. Manipulation and assay of small quantities of biological materials, and analysis of laboratory data.

BCH 453 Biochemistry of Gene Expression. *3(3-0-0) . F,S. Preq: BCH 451. Coreq: GN 411, MB 351.* Structure and function of nucleic acids and proteins. Synthesis of DNA, RNA, and proteins. Gene expression and Regulation. Methodologies of recombinant DNA research. Credit is not allowed for both BCH 453 and BCH 553.

BCH 454 Advanced Biochemistry Laboratory. *4(1-8-0) . F. Preq: BCH 452. Coreq: BCH 453.* Techniques in molecular biology and protein purification. Cloning and expression of a eukaryotic gene in bacteria followed by purification of the eukaryotic gene product. Microanalysis of DNA, RNA and protein.

BCH 455 Proteins and Molecular Mechanisms. *3(3-0-0) . S. Preq: BCH 451, BCH 453/553.* Principles of protein structure and function, protein folding, enzymology, ligand binding, protein transport, and metabolic pathways.

BCH 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and academic dean prior to the experience.

BCH 493 Special Problems in Biochemistry. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

BCH 495 Special Topics in Biochemistry. *1-5. F,S,Sum. Preq: Junior standing.* Offered as needed to present materials not normally available in regular BCH departmental courses or for new BCH courses on a trial basis.

BIOMANUFACTURING

BEC 220 Introduction to Drug Development and Careers in Biomanufacturing. *1(1-0-0) . F,S. Preq: BIO 181 or ZO 160. Coreq: CH 223.* Introduction to discovery and development of biopharmaceuticals, industrial enzymes, food ingredients and biologics. Discussion of majors that prepare students for positions in the biotechnology industry. Lectures from staff and from professionalsin the biotechnology industry focus on drug development, biopharmaceutical process development, design of biomanufacturing facilities, overview of methods used for manufacturing biopharmaceuticals, drug and enzyme purification, formulation, as well as careers in FDA compliance documentation related to manufacturing products using microbial biotechnology.

BEC 320 Fundamentals of Microbial Cell Culture. *2(1.50-0.50-0) . F,S. Preq: BIO 181 or BIO 183 or ZO 160.* This is a half-semester course. This introductory module addresses fundamental cell biology concepts and enables students to gain an understanding of the basic principles of microbiology, culture preparation, physiology and genetics of microbial cell cultures. The lab portion of the course provides students with practical experience in basic laboratory and culture techniques. Students who have completed MB 352 may not take this course for credit.

BEC 325 Fundamentals of Microbial Cell Biotransformations. *2(1.50-0.50-0) . F,S. Preq: BEC(MB) 320 or MB 352.* This is a half-semester course. Basic microbial cell culture theory and practice: cell physiology, mass balances, and metabolic control as seen in a dynamic bioreactor culture. The biological understanding, mathematical models, and engineering controls that enable a bioreactor process to be scalable, consistent, and robust. The lab portion of the course provides students with hands-on experience in culture techniques using bioreactors. Students who have completed BIT(CHE) 463 may not take this course for credit.

BEC 330 Principles and Applications of Bioseparations. *2(1.50-0.50-0) . F,S. Preq: CH 223.* Objectives, strategies, and approaches for recovery and purification of biomolecules, especially recombinant proteins. Description of common purification equipment, processes and materials used for cell lysis, precipitation, flocculation, membrane filtration, column chromatography, and centrifugation. Laboratories provide students with exposure to various techniques and the parameters that control protein isolation and purification of a recombinant protein. This is a half-semester course. Students who have completed BIT(CHE) 464 may not complete this course for credit.

BEC 436 Downstream Processing of Biomaterials. *2(1.50-0.50-0) . F,S. Preq: BEC 330.* Objectives, strategies, and approaches for recovery and purification of biomolecules, especially recombinant proteins. Laboratories in the intermediate-scale pilot plant provide students with exposure to various unit operations and the parameters that control protein isolation and purification of a recombinant protein produced by an E. coli. This is a half-semester course.

BEC 480 Large-scale Fermentation. *2(1.50-0.50-0) . F. Preq: BBS(BEC) 426.* Application of microbial fermentation techniques at production scale and evaluation of the inherent issues resulting from the integration of microbial

fermentation unit operations, scale-up/production, and current Good Manufacturing (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in media preparation, bioreactor operation, process utilities, and manufacturing quality systems that simulate microbial cell growth and product expression in a commercial cGMP facility. This is a half-semester course.

BEC 485 Large-scale Recovery and Purification. *2(1.50-0.50-0) . F,S. Preq: BEC 436.* Application of downstream bioprocessing techniques at production scale and evaluation of the inherent issues resulting from the integration of recovery and purification unit operations, scale-up/production issues, and current Good Manufacturing Practice (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in cell removal, cell disruption, purification, and manufacturing quality systems that simulate downstream bioprocessing in a commercial cGMP facility. This is a half-semester course.

BEC 495 Special Topics in Biomanufacturing. *1-4.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis. Departmental approval required.

BEC 497 Biomanufacturing Research Projects. *1-3. F,S,SUM1,SUM2.* Introduction to biomanufacturing research through experimental, theoretical, and literature studies. Oral and written presentation of reports. Departmental approval required.

BIOLOICAL SCIENCES

BIO 105 Biology in the Modern World. *3(3-0-0) . F,S,Sum.* Principles and concepts of biology including cellular structure and function, metabolism and energy transformation, homeostasis, reproduction, heredity, diversity of life, ecology, evolution and animal behavior. Emphasis on human affairs and human examples. For non-science students. Students may not receive credit for both BIO 105 and BIO 125 or BIO 181 or BIO 183.

BIO 106 Biology in the Modern World Laboratory. *1(0-2-0) . F,S,Sum. Coreq: BIO 105.* Laboratory experience in biological principles to complement BIO 105. For non-science students. Students may not receive credit for both BIO 106 and BIO 125, BIO 181 or BIO 183

BIO (ZO) 160 Introduction to Cellular and Developmental Zoology. *4(3-3-0) . S,Sum.* Basic concepts and principles of cellular and developmental zoology with emphasis on the physical basis of life, the cell as the fundamental unit of life and the mechanisms involved in the development of multicellular animals.

BIO 181 Introductory Biology I. *4(3-3-0) . F,S.* Emphasis on interactions of organisms with their environment, evolutionary change, genetic bases of adaptive traits and of regulation and control, and on critical thinking, problem solving, and effective communication. Students may not receive credit for both BIO 181 and either BIO 105 or BIO 125.

BIO 183 Introductory Biology II. *4(3-3-0) . F,S. Preq: BIO 181 or BIO 125.* Emphasis on adaptive strategies in meeting common challenges in diverse environments, role of natural selection in evolution of life forms, and on critical thinking, problem solving, experimental design, and effective communication.

BIO 491 Seminar on Professional Development in Biological Sciences. *1(1-0-0) . F.* Planning and analyzing strategies for professional development in the biological sciences utilizing discussion, guest lecturers, and field trips to nearby research laboratories and industrial plants. Intended primarily for juniors and seniors in anybiological discipline.

BIO 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* Learning experience in agriculture and life sciences within an academic framework with facilities and resources external to the campus. Contact and arrangements with prospective supervisors by the student. Prior approval by faculty advisor, prospective supervisor, and departmental teaching coordinator.

BIO 493 Special Problems in Biological Sciences. *1-6. F,S. Preq: Sophomore standing.* Learning experience in agriculture and life sciences within an academic framework with campus facilities and resources. Contact and arrangements with prospective supervisors by the student. Prior approval by faculty advisor, prospective supervisor, and department teaching coordinator.

BIO 495 Special Topics in Biology. *1-6. F,S,Sum.* Individualized study, under faculty supervision, of biological topics, and developmental course on a trial basis.

BIOTECHNOLOGY

BIT 295 Special Topics in Biotechnology. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

BIT 410 Manipulation of Recombinant DNA. *4(2-5-0) . F,S. Preq: BIO 181 or ZO/BIO 160 and CH 223 with a C- or better.* Introduction to molecular biology and protein chemistry. Theory behind laboratory techniques and overview of cloning strategies starting from nucleic acid or protein sequence data. Laboratory sessions involve subcloning, preparation of competent cells, transformation, screening recombinant DNA by colony hybridization and PCR, SDS-PAGE of recombinant protein, affinity purification, and western blots.

BIT 461 Sequencing cDNA Libraries. *2(2-5-0) . F, Alt. yrs.(even). Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Basic techniques in automated DNA sequencing and robotics. Colony picking and ordering cDNA libraries, use of PCR to amplify insert DNA, and strategies for large-scale automated sequencing. Principles of database management for ordering and accessing sequencing information. Half semester course, first part.

BIT 462 Gene Expression Analysis: Microarrays. *2(2-5-0) . F. Preq: BIT 410 or BIT 510.* Microarray analysis is an evolving technique with its basis in the dynamic properties of the nucleic acid hybridization. We will review current theory, techniques, instrumentation, troubleshooting, analysis tools, and advanced protocols for microarray analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment and have access to exceptional instrumentation. At the conclusion of this course, students should feel comfortable with microarray experimental design, its tools, an analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections

BIT (CHE) 463 Fermentation of Recombinant Microorganisms. *2(2-5-0) . S. Preq: BIT 360 or BIT 810 or MB 409 or BCH 454 or ZO 480.* Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinanat protein. Half semester course, first part.

BIT (CHE) 464 Protein Purification. *2(2-5-0) . S, Alt. yrs.(even). Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Comparison of several different chromatography techniques for protein purification. Construction of purification tables and SDS-and native-PAGE analysis. Cost-benefit analysis of industrial-scale procedures. Half semester course, second part.

BIT 465 Real-time PCR Techniques. *2(2-5-0) . S. Preq: BIT 410 or BIT 510.* Real time PCR is an evolving technique with its basis in the dynamic properties of the polymerase chain reaction and fluorescent detection. We will review current real-time theory, techniques, machinery, troubleshooting, tools, and advanced protocols for sequence detection including SYBR green, TaqMan, Beacons, multiplexing, and single nucleotide polymorphism analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment. At the conclusion of this course, students should feel comfortable with real-time experimental design, its tools, and analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections.

BIT 466 Animal Cell Culture Techniques. *2(2-5-0) . S. Preq: BIT 360 or BIT 810.* Introduction to animal cell culture techniques. Aseptic technique for vertebrate cell culture, media formulation, primary cell culture, long-term maintenance of cell lines, application of molecular techniques to in vitro situations. Half semester course, second part.

BIT 467 PCR and DNA Fingerprinting. *2(2-5-0) . F. Preq: BIT 510.* Introduction to polymerase chain reaction. Optimization of PCR reactions and primer design for DNA sequences using DNA databases available on the web. Laboratory sections include using rapid techniques for isolating and sequencing DNA from small amounts of sample and forensic identification of individuals using isolated human hairs. Credit is not allowed for both BIT 467 and BIT 567.

BIT 468 Genome Mapping. *2(2-5-0) . S. Preq: BIT 410 or BIT 510 or BCH 454.* Students will be introduced to basic techniques in genetic and physical mapping. The principles of DNA marker development, marker detection, genetic and physical mapping and DNA sequencing will be addressed from a practical view with an emphasis onagricultural applications. This is a half semester course. Student must register for both lecture and lab sections.

BIT 470 Advanced Animal Cell Culture: Bioreactor Culture. *2(2-4-0) . S. Preq: BIT 466 or BIT 566 or PO 566.* Principles of scaling animal cell seed-stock from frozen storage to three liter culture. Students will learn to assemble and operate a three-liter bioreactor to produce antibodies, as well as assess final product quantity using antibody techniques. This is a half-semester course.

BIT (BO) 481 Plant Tissue Culture and Transformation. *2(2-5-0) . S, Alt. yrs.(odd), Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Basic techniques in plant tissue culture and transformation. Empirical approaches to techniques in plant tissue culture, designing transgenes for expression in specific plant cell organelles and tissues, use of reporter genes to optimize transformation, and troubleshooting transformation. Laboratory session provide hands-on experience with plant tissue culture and transformation. Use of reporter genes, fluorescence microscopy and digital imaging. Half semester course, first part.

BIT 492 External Learning Experience. *1-6. F,S,Sum. Preq: BIT 360.* A learning experience in the area of biotechnology within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, and the departmental teaching coordinator prior to the experience. Project must be approved by the Academic Coordinator or Program Director of the Biotechnology Program.

BIT 493 Special Problems in Biotechnology. *1-6. F,S,Sum. Preq: BIT 360.* A learning experience within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective mentor(s) must be initiated by student and approved by a faculty adviser, the prospective mentor, and the departmental teaching coordinator prior to the experience. Project must be approved by the Academic Coordinator of Program Director of the Biotechnology Program.

BIT 495 Special Topics in Biotechnology. *1-3. F,S,Sum. Preq: BIT 360.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

BIOMEDICAL ENGINEERING

BME 201 Computer Methods in Biomedical Engineering. *3(2-2-0) . S. Preq: BME matriculated students.* Students develop computer-based problem solving techniques using Excel and MATLAB to solve introductory problems in Biomedical Engineering. Emphasis is on developing solution algorithms, implementing these with spreadsheets and computer programming, and presenting results in a clear and concise manner. Students registered for BME 201 who fail to matriculate into BME will be dropped from the course.

BME (MSE) 203 Introduction to the Materials Science of Biomaterials. *3(3-0-0) . F. Preq: C- or better in CH 101, CH 102 and PY 205.* This course introduces fundamental physical principles governing the structure, processing, properties and performance of metallic, ceramic and polymeric materials. Relationships are developed defining how mechanical, physical and chemical properties are controlled by microstructure and chemistry. Material failure modes are develped with an emphasis on biocompatibility and the applications/performance of materials in the human body. Basic aspects of material biocompatibility are presented, leading into studies of the current and future applications of biomaterials.

BME 204 Biomedical Measurements. *3(2-2-0) . S. Preq: BME Majors.* This course will introduce students to modern topics in biomedical engineering and areas of emphasis in the biomedical engineering curriculum through the study and use of biomedical measurement tools. The course will include a lecture and a laboratory component.

BME 252 Biomedical Engineering Design and Manufacturing I. *1(0-2-0) . F, S, Sum. Preq: BME Majors.* Students will learn the basic tools of design such as solid modeling by means of web-based tutorials and a series of small CAD project assignments. Students will learn to use current software for design, analysis, and computer-aided manufacturing (CAM). Students will also be introduced to modern manufacturing through the transition from CAD (Computer-Aided Design) to CAM using modern rapid manufacturing equipment to carry out one small, well-defined design and manufacturing project.

BME 301 Human Physiology for Engineers I. *3(2-2-0) . F. Preq: BME 201 and either ZO 160 or BIO 183, BME Majors. Coreq: BME 311.* This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on neural, sensory, muscle, and cardiac physiology. Autonomic neural and somatic motor control will be discussed. Engineering applications, including neural stimulators, functional imaging, cochlear implants, artificial noses, vestibular implants, visual implants, artificial larynges, pacemakers and defibrillators will be discussed. Assignments include computer-based exercises using MATLAB.

BME 302 Human Physiology for Engineers II. *3(2-2-0) . S. Preq: BME 301, MAE 208 or CE 215 ; BME majors.* This course explores a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on systems physiology described using mechanical properties. Topics include the physiological and mechanical behavior of the blood vessels, lungs, kidney muscles and larynx. In the course lab exercises, students investigate mechanical properties of fluids, electrolyte exchange in dialysis, spirometry and blood pressure measurement among other topics. The course culminates with the design of a novel laboratory experiment.

BME 311 Linear Systems in Biomedical Engineering. *3(3-0-0) . F. Preq: BME 201, ECE 331, BME Majors.* Fundamentals of linear systems analysis as applied to problems in biomedical modeling and instrumentation. Properties of biomedical systems and signals. Representation of continuous- and discrete-time signals and system response. Convolution. Fourier analysis in continuous and discrete domains. Laplace transform. Frequency response and its application in biomedical systems. Filter design. Circuit analogs to mechanical and thermodynamics systems and their applications in modeling biomedical systems. Applications in biomedical instrumentation. Students use MATLAB to simulate and analyze biomedical linear systems.

BME 312 Analog and Digital Circuits Laboratory. *1(0-3-0) . F. Preq: ECE 331, BME Majors.* Laboratory in analog and digital circuit analysis. Electrical safety; Exercises in resistor networks, capacitors and inductors, steady-state and dynamic circuit behavior, active circuits, amplifiers, logic gates, combinatorial and sequential circuits, elementary digital system design, A/D conversion, biomedical applications.

BME 342 Experimental & Analytical Methods in Biomechanical Engineering Analysis. *3(2-2-0) . S. Preq: BME 201; MAE 208 or CE 215; MAE 314 or CE 313; MA 341.* Experimental and analytic tools are developed and used to solve problems in biomedical engineering. Techniques include kinematic analysis, closed form and finite element analysis of stresses and strains in a body, and failure analysis. Transducersnecessary for experimental analysis and testing are introduced. Students learn advanced software packages such as the finite element program ANSYS and the dynamic analysis program ADAMS to assist in their analyses.

BME 352 Biomedical Engineering Design and Manufacturing II. *2(1-3-0) . S. Preq: BME 252; BME majors.* Students will be required to continue their use of the tools learned in Biomedical Design and Manufacturing 1 in the context of modern design practices and manufacturing processes. The organizational and project management tools of modern design will be introduced, and a technical discussion of a modern manufacturing technology will be introduced each week.

BME 412 Biomedical Signal Processing. *3(3-0-0) . S. Preq: BME 311, ST 370.* Fundamentals of continuous- and discrete-time signal processing as applied to problems in biomedical instrumentation. Properties of biomedical signals and instruments. Descriptions of random noise and signal processes. Interactions between randombiomedical signals and systems. Wiener filtering. Sampling theory. Discrete-time analysis. Applications of Z-transform and discrete Fourier transform. Digital filter design methods for biomedical instruments. Biomedical applications of filter design, signal restoration, and signal detection. Simulation, analysis, and design of biomedical signal processing systems using MATLAB.

BME 422 Fundamentals of Biomedical Instrumentation. *3(2-2-0) . S. Preq: BME 212 and ECE 331.* Fundamentals of biomedical instrument design and implementation. Sensing mechanisms, sensor microfabrication methods, sensor interfacing circuits, analog-to-digital conversion, biosignal capture and storage, embedded microprocessors, data compression methods, system integration and prototyping. Laboratory exercises using LabVIEW and MATLAB, supplement the topics presented in class lectures. Students build a sensor using cleanroom facilities in the BME department as part of a semester-long design project.

BME 425 Bioelectricity. *3(3-0-0) . F. Preq: BME 302 or (ZO 421 and a course in electrical circuits).* Quantitative analysis of excitable membranes and their signals, including plasma membrane characteristics, origin of electrical membrane potentials, action potentials, voltage clamp experiments, the Hodgkin-Huxley equations, propagation, subthresholdstimuli, extracellular fields, membrane biophysics, and electrophysiology of the heart. Design and development of an electrocardiogram analysis system.

BME 441 Biomechanics. *3(2-3-0) . F. Preq: ZO 160 or BIO 183; BME 342; ST 370.* Students study human body kinematics, force analysis of joints, and the structure and composition of biological materials. Emphasis is placed on the measurement of mechanical properties and the development and understanding of models of biological material mechanical behavior.

BME 451 Biomedical Engineering Senior Design I. *3(2-2-0) . F. Preq: BME 302, BME 352, and either ENG 331 or ENG 333, and completion of two of the suggested BME electives for their area of emphasis ; BME majors.* Design concepts of engineering problems: objectives, specifications, manufacturing, prior art, and analysis. Oral and written exercises in reverse engineering. Lectures in national and international standards, quality control, intellectual propertylaw, and engineering ethics. Team projects to design, build, and deliver a prototype device to aid a disabled person or other appropriate biomedical engineering project that provides an opportunity for real world engineering design and community outreach.

BME 452 Biomedical Engineering Senior Design II. *3(2-2-0) . S. Preq: BME 451, BME Majors.* Continuation of BME 451. Project analysis, design, scheduling, construction, and testing. Advanced written and oral technical communication. Teamwork and the function of engineering design in society. Major team project with a biomedical engineering theme.

BME (TE) 467 Mechanics of Tissues & Implants Requirements. *3(3-0-0) . S. Preq: ZO 160 or BIO 181; MAE 314.* Application of engineering and biological principles to understand the structure and performance of tendons, ligaments, skin, and bone; bone mechanics; viscoelasticity of soft biological tissues; models of soft biological tissues; mechanics of skeletal muscle; and tissue-derived devices as well as interfaces between native tissues and synthetic devices.

BME 495 Special Topics in Biomedical Engineering. *1-4. F,S,Sum.* Offered as needed for presenting material not normally available in regular BME Department courses or for new BME courses on a trial basis.

BME 498 Undergraduate Research in Biomedical Engineering. *3(0-9-0) . F, S, Sum.* Opportunity for hands-on faculty mentored research project in biomedical engineering. Course may be a stand-alone project completed in one semester/summer or serve as part of a two-semester project. Approved plan of work required with significant independent research culminating in a final paper and presentation at the NC State Undergraduate Research Symposium or other appropriate venue. Students must identify an advisor from within the BME faculty with whom to work on a regular basis. The advisor must approve the student prior to the student registering for the course. The BME Undergraduate Coordinator must approve the use of the course as a restricted elective for the BME degree. Departmental Approval Required

BUSINESS MANAGEMENT

BUS 110 Microcomputer Applications for Management. *2(2-0-0) . F,S,Sum.* Use of computers in management. Developing facility with using word processing, spreadsheet, and presentation software for solving management problems. Preparation for use of software tools in subsequent management courses. Substitutes for passing required test of proficiency with software applications. Credit for this course not allowed toward degrees in the College of Management.

BUS 201 Introduction to Business Processes. *3(3-0-0) . F,S.* Cross-functional treatment of major activities of business, such as product design, distribution, production, and marketing. Description of specific tasks, via lectures and case studies, in support of major business activities. Interactions among various functional areas of business.

BUS 225 Personal Finance. *3(3-0-0) . F,S.* Economic and financial strategies used to accumulate, manage and protect personal assets. Emphasizing income generation, expense reduction, investment selection, and wealth creation to meet future needs and goals. Topics include investing (mutual funds, stocks, etc.), annuities, deferred savings, insurance, retirement planning, estate planning, and real estate finance.

BUS 235 Topics in Leadership Seminar. *3(3-0-0) . S. Preq: Park Scholar Recipient.* Introduction to leadership, self-awareness, interpersonal needs, attitudes, cognitive style, values, ethics and values. Listening, communicating, interviewing, self-efficacy, empowerment, time and stress management, solving problems creatively, motivation, giving feedback and developing others. Team building and group dynamics. A history of leadership research, leadership concepts, characteristics, and principles.

BUS 295 Special Topics in Business Management. *1-6.* Experimental course development. Special topics in Business Management at the introductory level.

BUS 300 Business Career Planning. *1(1-0-0) . F. Preq: College of Management Majors must have passed Software Applications Proficiency Requirement.* Integration of work values, career interests, and skills and corporate environments and career fields related to business management. Development of proactive plans and skills to enhance marketability for placement into professional career paths inbusiness. Minimal fee assessed to cover cost of career tests administered during course.

BUS 305 Legal and Regulatory Environment. *3(3-0-0) . F,S. Preq: College of Management Majors must have passed Software Applications Proficiency Requirement.* Introduction to contract, tort, property, and agency law, the judicial system, common law, statutory law, and constitutional law. Review and discussion of the major statutes affecting business including antitrust, securities, employment, labor, environmental, international, and product safety laws.

BUS (EB) 310 Introduction to Entrepreneurship. *3(3-0-0) . F, S. Preq: Sophomore standing.* Introduction to planning, formation, and management of entrepreneurial ventures. Fundamental business concepts and managerial skills applied to entrepreneurial ventures. Course projects support experiential learning of critical skills. Some individual off-campus travel is required.

BUS 311 Entrepreneurship Skills. *3(3-0-0) . F, S. Preq: Sophomore standing.* Identification, understanding of practice of skills necessary for entrepreneurial success including networking, negotiation, leadership, presentation, and resource management. Examine characteristics of successful entrepreneurs through the use of articles, case studies, and individual student research and presentations on the traits, styles, and attributes of successful entrepreneurs. The course supports self-assessment with tools such as personality profiles and communication style profiles. Some individual off-campus travel is required.

BUS 320 Financial Management. *3(3-0-0) . F,S. Preq: ACC 210 and EC 201 or ARE 201 or EC 205; College of Management Majors must have passed Software Applications Proficiency Requirement.* Financial decision making by businesses, including capital structure and dividend decisions, capital budgeting and working capital management. Basic financial concepts such as risk and return measurement, portfolio theory and the Capital Asset Pricing Model.

BUS 330 Human Resource Management. *3(3-0-0) . F,S. Preq: BUS 201, Sophomore standing; College of Management Majors must have passed Software Applications Proficiency Requirement.* The systematic principles for managing the human resource component of organizations. Topics include: environmental influences on planning, recruitment, and selection; managing workforce diversity; developing effectiveness and enhancing productivity; compensation, benefits, and security; and strengthening employee-management relations.

BUS 335 Organizational Behavior. *3(3-0-0) . F,S. Preq: 9 hrs. of social science or 6 hours of social science plus BUS 201; College of Management Majors must have passed Software Applications Proficiency Requirement.* Survey of contemporary managerial applications for managing people in modern organizations. Topics include: motivation, group dynamics, team development, ethics, communications, organizational politics, leadership, power, organizational development, organizational design and structure. Current managerial issues include total quality management and technology management.

BUS (CSC) 340 Information Systems Management. *3(3-0-0) . F,S. Preq: All students must have passed Software Applications Proficiency Requirement.* Fundamentals of information systems development and use in organizational setting. Primary topics: information systems (IS), concepts, hardware, software, telecommunications, database management. IS development, applications and

management in various business processes, global issues, security and ethical challenges.

BUS (EB, ST) 350 Economics and Business Statistics. *3(3-1-0) . F,S,Sum. Preq: MA 114; College of Management Majors must have passed Software Applications Proficiency Requirement.* Introduction to statistics applied to management, accounting, and economic problems. Emphasis on statistical estimation, inference, simple and multiple regression, and analysis of variance. Use of computers to apply statistical methods to problemsencountered in management and economics.

BUS 360 Marketing Methods. *3(3-0-0) . F,S. Preq: BUS 201, Sophomore standing, College of Management Majors must have passed Software Applications Proficiency Requirement.* Examination of decisions affecting marketing of goods and services in consumer, industrial and international markets. Emphasis on the role of marketing in a managerial context. Areas studied include: the activities of marketing research, identification of marketing opportunities, and the development of marketing mix strategies including the decisions concerning pricing, distribution, promotion and product design.

BUS 370 Operations Management. *3(3-0-0) . F,S. Preq: BUS 201, BUS (ST) 350; College of Management Majors must have passed Software Applications Proficiency Requirement.* Concepts in planning, controlling, and managing the operations function of manufacturing and service firms. Topics include operations strategy, process choice decisions, forecasting, production planning and control, and trends in operations management. Common tools for informed decision-making in these areas.

BUS (PRT) 406 Sports Law. *3(3-0-0) . F. Preq: Junior standing.* Fundamental principles of law, especially tort and contract law, applied to sports situations. Analysis of liability of sports personnel in various roles including participant, coach, promoter, trainer, and official. Analysis of common law court decisions in sports contexts as well as key state and federal statutory legislation such as civil rights and antitrust.

BUS 412 Finance and Accounting for Entrepreneurs. *3(3-0-0) . S. Preq: BUS 310; BUS 311 ; Junior standing. Coreq: BUS 413.* Financial planning for new ventures including financial reporting conventions and projection of critical financial amounts for new ventures. Introduction to fundamental accounting and finance concepts applied in the context of entrepreneurial ventures. Topics include projection of revenues, expenses, capital expenditures, cash flows, and balance sheet amounts; and the creation of pro-forma financial statements. Individual student projects integrate financial projections and pro-forma financial statements with the preparation of a complete business plan. Some individual off-campus travel is required.

BUS 413 New Venture Planning. *3(3-0-0) . S. Preq: BUS 310 and BUS 311 or BUS Majors or ACC Majors, Junior standing. Coreq: BUS 412.* Developing the business plan for a new venture and the entrepreneurial process of executing the first phases of new venture creation. Topics include idea conception, entrepreneurship, business planning, market research, entrepreneurial opportunitiesand strategies. Emphasis is placed on high growth business opportunities. The final deliverable is a complete business plan for a high growth venture and formal presentation of the plan to mock investors. Some individual off-campus travel is required.

BUS 419 Entrepreneurship Practicum. *3(1-7-0) . F, S. Preq: New Venture Planning (BUS 413); Finance and Accounting for Entrepreneurs (BUS 412) ; Junior standing.* Application of entrepreneurship skills and knowledge to plan an entrepreneurial venture envisioned by the student. This course is the capstone course for the Minor in Entrepreneurship. The final deliverable includes an evaluation of the project and a formal presentation that includes a summary of the work completed and the implications of that work each student's project. Some individual off-campus travel is required.

BUS 420 Financial Management of Corporations. *3(3-0-0) . F,S. Preq: BUS 320, BUS(ST) 350.* Advanced theory and practice of corporate financial management. Techniques for evaluating alternative investment, financing, capital structure, and dividend policy decisions. International aspects of corporate financial management. Use of personalcomputers in applying financial management theory to common financial problems.

BUS 422 Investments and Portfolio Management. *3(3-0-0) . F,S. Preq: BUS(ST) 350 or ST 311, and BUS 320.* Analysis of the investment process, dichotomized into security analysis and portfolio management. Background information on financial assets, securities markets, and risk-return concepts. Analysis of valuation theory and techniques, modern portfoliotheory and portfolio performance.

BUS 425 Advanced Personal Financial Management. *3(3-0-0) . F,S. Preq: BUS 320.* Detailed economic, financial and legal analysis of risk management, retirement planning, nontraditional investments, estate planning. Strong emphasis on professional financial planning for those interested in personal finance as a career. Directly applicable for needs of small business.

BUS 426 International Financial Management. *3(3-0-0) . S. Preq: BUS 320, BUS 350.* Foreign exchange markets and their implications for direct and portfolio investment abroad. International capital markets. Multinational company exchange rate exposure measurement and management. Techniques and instruments of financing international trade and investment. Multinational capital budgeting and capital cost measurement. Techniques of international cash management. Credit for both BUS 426 and EC 449 not allowed.

BUS 432 Industrial Relations. *3(3-0-0) . F,S. Preq: EC 201, BUS 330.* The role of collective bargaining in the labor market. Determinants of the pattern of union membership today and its growth rate. The objectives and tactics of both labor and management within public policy guidelines. Analysis of the impact of unions on job security, productivity, and compensation.

BUS 434 Compensation Systems. *3(3-0-0) . F,S. Preq: BUS 330.* Compensation philosophy, strategy, and policy. Earnings, individual and group incentive plans, voluntary and mandated benefits. Legal, regulatory, economic, and strategic issues affecting compensation and benefits. Strategies for developing the structure and level of compensation to enhance organizational performance.

BUS 435 Leadership and Management. *3(3-0-0) . F,S. Preq: BUS 330.* Development of leadership and management skills for organizational settings. Self-awareness: interpersonal needs, attitudes toward change; cognitive styles, ethics and values; listening; communicating; interviewing; time and stress management; creativity and managing creativity. Team building and group dynamics. Leadership and followership: theory and case studies (Churchill, Antigone; Henry V; Machiavelli); the use of power and authority; women and leadership the use of language in leadership embodiment of leadership traits; effective traits and characteristics of great leaders.

BUS 436 Training, Development and Performance Management. *3(3-0-0) . F,S. Preq: BUS 330.* Training, development and performance management functions in organizations. Needs assessment, legal issues, training program design, learning, training methods, transfer of training, effectiveness and utility of training programs, executive development, criteria development for performance appraisal, validation, instrumentation, sources, accuracy, and feedback.

BUS 438 Staffing. *3(3-0-0) . F,S. Preq: BUS 330.* Staffing of contemporary organizations including strategic and environmental influences on: HR planning, job analysis, measurement, recruitment, assessment and selection, decision making, employment, and termination. Considerable emphasis on employment and labor recruitment, assessment and selection, decision making, employment, and termination. Considerable emphasis on employment and labor legislation.

BUS 440 Database Management. *3(3-0-0) . F,S. Preq: BUS 340.* The fundamentals of database management within business applications. Data structures, user requirements, structured query language, query by example, application development, user interface design.

BUS 441 Business Data Communications and Networking. *3(3-0-0) . F,S. Preq: BUS 340.* The fundamentals of computer networking and the use of computer networks in business applications. Client-server networks, architecture, network hardware and software, key issues in network management, network security, and the fundamentals of datacommunications.

BUS 442 Information Systems Development. *3(3-0-0) . F,S. Preq: BUS 440.* Concepts and skills necessary for developing information systems to aid in managerial decisions. Hands-on experience with development theory and concepts; objected-oriented design concepts, graphical user interface design concepts, algorithm designconcepts, and data structures.

BUS 449 Information Technology Capstone. *3(0-10-0) . S. Coreq: BUS 442.* This is a completely project-oriented course. Students will work on real applications for national or local firm(s) to solve SliveS IT problems. Students will work in teams to develop client deliverables and present their final work to an appropriate industry-based management team. Field trips and/or outside class activities (including client/consultant work) are a major part of this course. Students who are unable to participate in these types of events should not enroll in this course.

BUS 455 Quantitative Methods for Management. *3(3-0-0) . S. Preq: EC 201 or ARE 201, and BUS(ST) 350.* Formulation and use of quantitative techniques for analyzing management problems. Linear programming, decision making under uncertainty and forecasting methods applied to problems in operations management, marketing, finance, human resource management, accounting, other areas. Use of computer software.

BUS 462 Marketing Research. *3(3-0-0) . F,S. Preq: BUS 360 and BUS(ST) 350.* The use, collection, organization and analysis of information pertinent to marketing decisions. Use of qualitative and quantitative data in the solution of specific marketing problems.

BUS 463 Retail Management. *3(3-0-0) . F, S. Preq: BUS 360.* Analysis of concepts, issues, and methods involved in marketing products and services to the end consumer. Emphasis on the creation of new retail concepts and managing multiple retail channels, including the electronic channel.

BUS 464 International Marketing. *3(3-0-0) . S. Preq: BUS 360.* Analysis of concepts, issues, and methods involved in marketing of products across national boundaries. Emphasis on distinctive opportunities and constraints in the international environment, international marketing strategies, and international marketing management techniques.

BUS 465 Integrated Marketing Communications Management. *3(3-0-0) . F,S. Preq: BUS 360.* Development of marketing communication theory and exploration of integrated marketing communication (IMC) practice. Topics include: IMC planning, management and budgeting; IMC strategy development and execution; media strategy and research; advertising research; ethical and legal issues; creativity; IMC ideation, campaign development; and campaign presentation. This is partially web-based course.

BUS 466 Personal Selling. *3(3-0-0) . F,S. Preq: BUS 360.* Careers and professionalism in business-to-business marketing. Buying behavior, selling process, and relationship marketing. Sales and self management.

BUS 469 Integrated Marketing Communication Project. *3(3-0-0) . S. Preq: BUS 360 and either BUS 462 or BUS 465.* Development of an Integrated Marketing Communications (IMC) project, including marketing research, marketing and IMC planning, media planning, budgeting, creative strategy development, creative production, planshook writing and final competitive presentation to marketing communications professionals.

BUS 472 Operations Planning and Control Systems. *3(3-0-0) . F. Preq: BUS 370.* Design and management of operations planning and control systems for manufacturing and service firms. Forecasting, capacity management, production and work force scheduling, project management, just-in-time and time-based competition, the impact ofinformation technologies on planning and control systems.

BUS 473 Supply Chain Management. *3(3-0-0) . S. Preq: BUS 370.* Purchasing, materials management, and logistics. Purchasing systems, supplier-based strategies, price-cost management, value analysis. Inventory strategies, quantity and quality decisions, materials planning. Logistics strategies for services and manufacturing.

BUS 474 Logistics Management. *3(3-0-0) . F, S. Preq: BUS 370.* Management of physical flows of goods between firms, management of inventories that support those flows, and assessment of the effects of freight transportation choices on these management activities. A variety of conceptual frameworks and quantitative tools are used to formulate the basis for effective logistics decision making and relate these decisions to broader issues in managing the entire supply chain and fulfilling the strategic objectives of a firm. A nominal fee for simulation software may be required.

BUS 478 Business Process Management. *3(3-0-0) . F. Preq: BUS 370.* Major tools, techniques, and strategies used for designing and improving business processes, including process mapping, process analysis, continuous process improvement tools and techniques, strategies for process design, and process reengineering.Major group project in process analysis and improvement.

BUS 480 Business Policy and Strategy. *3(3-0-0) . F,S. Preq: BUS 305, 320, 360, BUS(ST) 350.* Comprehensive analysis of administrative policy-making from the point of view of the general manager. Integration of perspectives from marketing, finance, and other functional areas of management. Use of case analyses and written reports to develop decision making skills.

BUS 483 Entrepreneurship. *3(3-0-0) . F,S. Preq: Junior standing.* Elements and application of the entrepreneurial process. Entrepreneurship, business planning, entrepreneurial opportunities and strategies, structuring and financing a venture, managing growth and risk, and intrapreneurship. Development of business plan.

BUS 495 Special Topics in Business Management. *1-6.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

BUS 498 Independent Study in Business Management. *1-6. F,S,Sum.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Department Head.

CIVIL ENGINEERING

CE 200 Civil Engineering, Measurements, and Surveys. *3(2-3-0) . S. Preq: CSC 112 or 114. Coreq: ST 370.* Plane surveying, topographical surveying, horizontal and vertical curves, topographic surveys, construction surveys, earthwork, route surveying. Use of computers to adjust measured quantities, to calculate coordinates and areas, and to locate points for design grades and planned roadways. Mathematical topics for surveying and construction including probability, error and precision; matrix operations; allocation theory; linear programming; network analysis; and constraint based optimization.

CE 201 Civil Engineering Measurements and Surveys. *2(1-3-0) . F,S. Preq: CSC 112 or 114; GC 101 or 120. Coreq: ST 370.* Plane surveying, topographical surveying, horizontal and vertical curves, topographic surveys, construction surveys, earthwork, route surveying. Use of computers to adjust measured quantities, to calculate coordinates and areas, and to locate points for design grades and planned roadways. Credit will not be given for both CE 200 and CE 201

CE 203 Global Positioning and Geographical Information Systems Applications. *1(1-0-0) . F. Preq: GC 120 ; CE, CEM, ENE, or BE Majors. Coreq: ST 370.* Applications of global positioning systems and geographical information systems to civil engineering projects. Brief coverage of the fundamental concepts of the systems. Selection of hardware and software appropriate for applications. Relevant analysis tools and databases.

CE 213 Introduction to Mechanics. *3(3-0-0) . F,S,Sum. Preq: PY 205. Coreq: MA 242.* Study of the state of rest or motion of bodies subjected to the action of forces. Properties of force systems, free body diagrams, concepts of equilibrium, kinematics of particles, Newton's laws, conservational principles of energy of momentum in mechanics, mechanical vibrations. Not for CE department majors.

CE 214 Engineering Mechanics-Statics. *3(3-0-0) . F,S,Sum. Preq: PY 205. Coreq: MA 242.* Basic force concepts and equilibrium analysis; distributed forces; centroids; moments of inertia; application to structural elements.

CE 215 Engineering Mechanics-Dynamics. *3(3-0-0) . F,S,Sum. Preq: Grade of C or better in CE 214, MA 242.* Kinematics and kinetics of particles; mass flow; vibrations; plane kinematics and kinetics of rigid bodies; selected topics from three-dimensional rigid body dynamics, and orbital motion.

CE 261 Construction Engineering Systems. *3(3-0-0) . S. Preq: CEM Majors and Management Majors. Coreq: ST 370.* Introduction to engineering economy, and principles and techniques of optimization for Construction Engineering and Management, including risk assessment. Credit may not be received for both CE 261 and CE 375.

CE 280 Principles of Environmental Engineering. *3(3-0-0) . F. Preq: Matriculation into ENE, MA 241, Grade of C or better in CH 201. Coreq: BIO 125.* Emphasis on types of pollutants and their fate and effect in the environment. Environmental chemistry and microbiology; ecology; water quality in lakes, streams, subsurface environments, and other natural systems; public health issues and hazardouswaste management.

CE 297 Current Topics in Civil Engineering. *1-4. F, S, Sum.* Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with Department Head.

CE 305 Traffic Engineering. *3(3-3-0) . F,S. Preq: CE 215 and ST 370.* Integrated approach to planning, design, and operation of transportation systems with an emphasis on highway and street systems. Roadway design, traffic operations and performance, and control systems.

CE 313 Mechanics of Solids. *3(3-0-0) . F,S,Sum. Preq: Grade of C or better in CE 214, MA 242.* Elementary analysis of deformable solids subjected to force systems. Concepts of stress and strain; one, two and three-dimensional stress-strain relationships for the linear elastic solid. Statically determinate and indeterminate axial force, torsion and bending members. Stress transformations, pressure vessels, combined loadings. Introduction to column buckling.

CE 324 Structural Behavior Measurement. *1(0-3-0) . F,S. Preq: CE 215; Grade of C or better in CE 313.* Theory and application of strain, displacement, and acceleration measurements. Verification of structural theories. Error Analysis. Bending of determinant and indeterminate beams, twisting of circular tubes, buckling of columns, and vibration of shear buildings.

CE 325 Structural Analysis I. *3(3-0-0) . F,S. Preq: CSC 116; Grade of C-or better in CE 313.* Analysis of determinate and indeterminate bars, trusses, beams and frames using the matrix displacement method. Qualitative deflected shapes and shear and bending moment diagrams. Computer implementation of analysis procedures using MATLAB and commercial structural analysis software.

CE 327 Reinforced Concrete Design. *3(3-0-0) . F,S,Sum. Preq: Grade of C or better in CE 313; CE 332.* Behavior, strength, and design of reinforced concrete members subjected to moment, shear, and axial forces. Introduction to the design of reinforced concrete structures.

CE 332 Materials of Construction. *3(2-3-0) . F,S. Preq: MSE 200; CSC 112 or 114; Junior standing in CE.* Manufacture and properties of mineral and bituminous cements and mineral aggregates. Mechanical properties and durability of portland cement concrete, bituminous mixtures, masonry units, timber products, and miscellaneous construction materials. Materials testing.

CE 342 Engineering Behavior of Soils and Foundations. *4(3-2-0) . F,S,Sum. Preq: CE 313. Coreq: CE 382.* Description, identification, and engineering classification of soils. The basic principles and mechanics of flow of water through soils, deformation and strength of soils, and the processes of consolidation and compaction. Effective stress concepts, stress and settlement analyses, and evaluation of shear strength. Methods of analysis and geotechnical engineering design concepts.

CE 367 Mechanical and Electrical Systems in Buildings. *3(3-0-0) . S. Preq: CE 382.* Introduction to mechanical and electrical systems in building construction. Includes HVAC, lighting and electrical systems, focusing on design concepts, equipment application and design of the construction process for modern building systems.

CE 373 Fundamentals of Environmental Engineering. *3(3-0-0) . F,S. Preq: Grade of C- or better in CH 201 or BIO 181. Coreq: CHE 205 or CE 382.* Overview of contaminants in water, air and terrestrial environments. Effect of human activity on environmental quality and regulatory standards. Environmental chemistry and microbiology. Introduction to water and wastewater treatment, air qualitycontrol, solid and hazardous waste management.

CE 374 Environmental Engineering Laboratory. *2(1-4-0) . F. Preq: Junior Standing in ENE, C or better in CE 373, CH 220 or CH 221.* Experimental techniques for the analysis of water and wastewater quality parameters; interpretation of the status of the environment based on measurements such as acidity, alkalinity, solids, DO, BOD, COD, plate counts and volatile organics.

CE 375 Civil Engineering Systems. *3(3-0-0) . F,S. Preq: CSC 112 or 114. Coreq: MA 341 or MA 305.* A broad perspective, systematic approach to civil planning, analysis, evaluation and design for large scale projects in construction, structures, transportation, water resources and other civil engineering areas.

CE 381 Hydraulics Systems Measurements Lab. *1(0-3-0) . F,S,Sum. Coreq: CE 382.* Introduction to experimental techniques for the analysis of hydraulic systems; measurement of viscosity, fluid pressures, velocity distributions, flow rates; investigations into the friction, momentum transfer, and turbulence on fluid flow.

CE 382 Hydraulics. *3(3-0-0) . F,S. Preq: CE 214, Junior standing in CE, CEM, ENE, BE; or BME. Coreq: MA 341, MA 305, or ST 370.* Fluid properties; mass, energy and momentum conservation laws; dimensional analysis and modeling; laminar and turbulent flows; surface and form resistance; flow in pipes and open channels; elementary hydrodynamics; fluid measurements; characteristics of hydraulic machines.

CE 383 Hydrology and Urban Water Systems. *3(3-0-0) . F,S. Preq: Grade of C or better in CE 382 ; For CE, ENE, and CEM Majors.* Study of engineering hydrology and design of elements of urban stormwater systems. Commonly encountered applications in urban stormwater management, flood control and groundwater engineering. Familiarization with effects of watershed development onquantity and quality of streamflow.

CE 400 Transportation Engineering Project. *3(1-4-0) . S. Preq: CE 305 and CE 375.* Integrated team approach to design of major transportation engineering projects. Professional topics in transportation engineering practice.

CE 401 Transportation Systems Engineering. *3(3-0-0) . F,S. Preq: CE 305.* Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization.

CE 413 Principles of Pavement Design. *3(3-0-0) . S. Preq: CE 332, CE 342.* Basic principles of analysis, design and performance of highway and airport pavements with critical evaluation of current design and maintenance strategies.

CE 420 Structural Engineering Project. *3(2-2-0) . F,S. Preq: CE 327, CE 375 and CE 426. Coreq: CE 425.* Planning, analysis and design of complete structural systems composed of steel and reinforced concrete. Professional topics in structural engineering practice.

CE 421 Structural Engineering Senior Project - Bridge Design. *3(2-2-0) . F. Preq: CE 327, CE 426. Coreq: CE 425.* This structural engineering senior project course covers the fundamentals of bridge analysis and design including conceptual design, superstructure analysis, AASHTO-LRFD bridge specifications, flat slab bridge design, pre-stressed concrete bridge design, strut and tie modeling, column design, and foundations. A series of three bridges will be designed including a cable stay or suspension pedestrian bridge, flat slab bridge, and girder bridge. At the conclusion of the course, students will be able to analyze and design simple, but complete concrete bridge structures.

CE 425 Structural Analysis II. *3(3-0-0) . F. Preq: CE 325.* Analysis of beam, 2D and 3D truss, 2D and 3D frame and plane strain structures using the matrix displacement method. Introduction to the finite element method of analysis by deriving the element stiffness matrices using Virtual Work. Beam and frame elements include shearing deformation and geometric stiffness effects. Computer implementation of analysis procedures using MATLAB and commercial structural analysis software. Modeling issues including convergence, symmetry and antisymmetry. Introduction to structural dynamics. Credit not given for both CE 425 and CE 525.

CE 426 Structural Steel Design. *3(3-0-0) . F,S,Sum. Preq: CE 325.* Design and behavior of structural steel members and their connections subjected to moment, shear, and axial forces. Introduction to the design of steel structures.

CE (MEA) 435 Engineering Geology. *3(3-0-0) . S. Preq: MEA 101 and Junior standing in colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences or Textiles.* Application of both geology and geotechnical engineering to engineering projects. Illustrations of relevant materials properties and techniques utilized in describing subsurface conditions.

CE 440 Geotechnical Engineering Project. *3(1-4-0) . F. Preq: CE 342, CE 375.* Integrated team approach to design of building foundations involving site selection, analysis and design of shallow and deep foundations, establishment of performance criteria, economic analysis, identification of potential construction problems andmatters regarding professional practice and ethics.

CE 443 Seepage, Earth Embankments and Retaining Structures. *3(3-0-0) . F,S. Preq: CE 342 and CE 375.* Review of shear strength concepts; ground water hydraulics; slope stability; lateral earth pressure problems; placement of fills.

CE 463 Construction Estimating, Planning, and Control. *3(2-2-0) . F. Preq: CE 261.* Overview of the construction industry; life cycle of construction

projects, work breakdown structure, activity cost and time estimation, computerized planning and scheduling methods, resource leveling, time-cost tradeoff; computerized cost estimating, bidding and negotiation strategies; and cost/schedule control systems.

CE 464 Legal Aspects of Contracting. *3(3-0-0) . F. Preq: Senior standing in CE, CEC, or CEM.* Legal aspects of contract documents, drawings and specifications; owner-engineer-constructor relationships and responsibilities; bids and contract performance, Labor laws; governmental administrative and regulatory agencies; torts; business organizations; ethics and professionalism.

CE 465 Construction Equipment and Methods. *3(3-0-0) . S. Preq: ST 370; CE 215. Coreq: CE 261 or equivalent.* Study of construction operations as dynamic production processes. Utilization of equipment and other resources to achieve highest levels of productivity, safety, and quality. Covers a wide range of traditional and state-of-the-art construction methods.

CE 466 Building Construction Engineering. *3(2-2-0) . F. Coreq: CE 327.* Construction processes for buildings and other structures including codes and standards, structural and architectural components and systems, form work and bracing design, erection and assembly methods.

CE 469 Construction Engineering Project. *3(1-6-0) . F,S. Preq: CE 463. Last semester in CEM. Coreq: CE 464.* Capstone course involving integrated team approach in the design of the construction process, utilizing computerized tools for cost estimation, planning, scheduling, process design, and management of two construction projects. Each student also selects an individual project. Lecture topics include: ethics, professionalism, marketing, bid presentations, business planning, finance, and other appropriate topics by guest speakers from industry.

CE 470 Physical Processes of Environmental Engineering. *3(3-0-0) . S. Preq: CE 280, CHE 225 and Grade of C or better in CE 382. Coreq: CE 381, and MAE 301 or CHE 315.* The fundamentals of physical processes of mass, momentum and energy transfer in fluid systems as applied to environmental engineering. Examples drawn from wastewater treatment, air pollution, surface and groundwater pollution, and solid and hazardous waste.

CE 476 Air Pollution Control. *3(3-0-0) . F. Preq: CE 373, CE 375, MAE 301, ST 370; or CHE 450(CHE Majors). Coreq: ST 370 or CHE 450.* Introduction to air pollution control fundamentals and design. Fundamentals include the physics, chemistry and thermodynamics of pollutant formation, prevention and control. Design will include gas treatment, process modification, and feedstock modification. Pollutants to be addressed include sulfur dioxide, nitrogen oxides, particulate matter, volatile organic compounds, hydrocarbons, and air toxics. Credit for both CE 476 and CE 576 will not be given.

CE 477 Principles of Solid Waste Engineering. *3(3-0-0) . S. Preq: CE 373, CE 375, CE 382. Coreq: CE 342.* Solid waste management including generation, storage, transportation, processing, land disposal and regulation. Processing alternatives with evaluation of engineering decisions.

CE (MEA) 479 Air Quality. *3(3-0-0) . S. Preq: CE 373,CE 382; or CHE 311(CHE Majors); or MEA 421 (MEA Majors). Coreq: ST 370; ST 380 (MEA Majors).* Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the Sacid5 rain; problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 orCE/MEA 579.

CE 480 Water Resources Engineering Project. *3(1-4-0) . S. Preq: CE 375 and Grade of C or better in CE 382 and CE 383.* Engineering design of selected projects in water resources engineering involving interactions with other scientific and engineering disciplines. Discussion of ethical conduct and professional engineering practice. Projects will include site work, storm drainage, water supply, water transmission and water-quality issues.

CE 481 Environmental Engineering Project. *3(1-4-0) . S. Preq: CE 374, 375, 383, 484. Coreq: Two of: CE 476, 477, 479, 488.* Engineering design of selected projects in environmental engineering involving interactions with other scientific and engineering disciplines. Discussion of ethical conduct and professional engineering practice.

CE 484 Water Supply and Waste Water Systems. *3(3-0-0) . F. Preq: CE 373, CE 382.* Elements of the design of water supply and wastewater disposal systems.

CE 487 Introduction to Coastal and Ocean Engineering. *3(3-0-0) . S. Preq: Senior standing and CE 382.* Introduction to the analysis of civil engineering projects in the ocean and along the coastline. Basic wave mechanics, tides, and ocean dynamics as applied to the understanding of coastal erosion control and other marine problems. An optional two-day field trip to the North Carolina Outer Banks at a nominal student expense is a regular feature of the course.

CE 488 Water Resources Engineering. *3(3-0-0) . S. Preq: CE 375. Coreq: CE 383.* Extension of the concepts of fluid mechanics and hydraulics to applications in water supply, water transmission, water distribution networks and open channels to include water-supply reservoirs, pump and pipe selection, determinate and indeterminatepipe networks, and analysis of open channels with appurtenances.

CE 497 Current Topics in Civil Engineering. *1-4. F,S,Sum.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

CE 498 Special Problems in Civil Engineering. *1-4. F,S. Preq: Senior standing.* Directed reading in the literature of civil engineering, introduction to research methodology, seminar discussion dealing with special civil engineering topics of current interest.

CHEMISTRY

CH 100 Chemistry and Society. *4(4-0-0) . F,S,Sum.* Awareness and understanding of chemistry in everyday life for the non-science student. Non-mathematical treatment of essential fundamental concepts. Emphasis on practical applications of chemistry to consumer affairs, energy, medicine, food, sports, and pollution. Credit is not allowed for CH 100 if student has prior credit for CH 101.

CH 101 Chemistry - A Molecular Science. *3(3-1-1) . F,S,Sum. Preq: One Year of High School chemistry or completion of CH 111 with grade of C- or better; and eligibility for MA 107. Coreq: CH 102.* A fundamental study of molecular bonding, structure, and reactivity. Principles of atomic structure, ionic and covalent bonding, reaction energetics, intermolecular forces, precipitation reactions, acid/base reactions, oxidation/reduction processes, and introductions to organic and inorganic chemistry.

CH 102 General Chemistry Laboratory. *1(0-2-0) . F,S,Sum. Coreq: CH 101.* Laboratory experience to accompany CH 101. Introduction to basic laboratory equipment and skills.

CH 108 Computer Applications in Chemistry II. *1(0-3-0) . S. Preq: CH 106, CH Majors. Coreq: CH 201.* A supplement to CH 202 laboratory, for chemistry majors. The use of computers in mathematical modeling of chemical concepts; applications of computer graphics to structure drawing, molecular modeling, and scientific illustration.

CH 111 Preparatory Chemistry. *3(3-0-0) . F,S.* Preparation for CH101. Review of main topics from high school emphasizing nomenclature, vocabulary, the periodic table and problem solving. Emphasis on mathematical skills, data handling, reaction types, stoichiometry and solutions. Credit for CH 111 is not allowed if a student has prior credit in CH 101. Credit for CH 111 does not count towards graduation for students in curricula that require CH 101.

CH 201 Chemistry - A Quantitative Science. *3(3-0-1) . F,S,Sum. Preq: CH 101 with grade C- or better and eligibility for MA 121 or higher. Coreq: CH 202.* Detailed quantitative aspects of solutions, solution stoichiometry, thermodynamics, chemical equilibrium, acid-base equilibria, solubility equilibria, electrochemistry, chemical kinetics, and nuclear chemistry.

CH 202 Quantitative Chemistry Laboratory. *1(0-3-0) . F,S,Sum. Preq: CH 101, CH 102. Coreq: CH 201.* Laboratory experience to complement CH 201. Experimental exploration of thermodynamic, kinetic, and electrochemical behavior.

CH 211 Analytical Chemistry I. *3(3-0-0) . S. Preq: CH 108. Coreq: CH 212 and PY 208.* Methods of quantitative analysis based on solution chemistry, potentiometry, coulometry, chromatography, and molecular absorption and

fluorescence spectroscopy. Statistics of measurement precision. Credit not allowed for both CH 211 and CH 315.

CH 212 Analytical Chemistry Laboratory I. *1(0-3-0) . S. Coreq: CH 211.* Laboratory experiments in volumetric analysis, ion selective electrodes, potentiometry, molecular absorption and fluorescence spectroscopy, acid/base chemistry, and computer applications. Precision, accuracy, and statistical analysis emphasized.

CH 220 Introductory Organic Chemistry. *4(3-3-0) . F,S,Sum. Preq: Completion of CH 101 with a grade of C- or better.* A one-semester course in the fundamental principles of organic chemistry. Preparation, reactions, and physical properties of alkanes, cycloalkanes, alcohols, alkyl halides, aromatic compounds, aldehydes, ketones, organic acids, acid derivatives, and amines. Credit is not allowed for both CH 220 and CH 221.

CH 221 Organic Chemistry I. *4(3-3-0) . F,S,Sum. Preq: CH 101.* First half of two-semester sequence in the fundamentals of modern organic chemistry. Structure and bonding, stereochemistry, reactivity and synthesis of carbon compounds. Detailed coverage of aliphatic hydrocarbons, alcohols, ethers, and alkyl halides. Introduction to spectral techniques. Credit is not allowed for both CH 220 and CH 221.

CH 223 Organic Chemistry II. *4(3-3-0) . F,S,Sum. Preq: CH 221.* Second half of a two-semester sequence in modern organic chemistry. Continuation of mechanistic approach to reactions and synthesis of organic compounds. Detailed coverage of carbonyl compounds (aldehydes, ketones, acids), aromatic chemistry and amines. Spectral techniques employed throughout.

CH 230 Computational Chemistry Lab I. *1(0-2-0) . F. Preq: CH 221. Coreq: MA 242.* An introduction to computational methods in the chemical sciences. A quantitative introduction to inter- and intramolecular forces in gas and condensed phases. Potential energy surfaces of molecules and chemical reactions. First of a two-semester sequence.

CH 232 Computational Chemistry Lab II. *1(0-2-0) . S. Preq: CH 221. Coreq: MA 241.* An introduction to computational methods in the chemical sciences. A computer-based introduction to quantum mechanics, including atomic and molecular orbitals and molecular orbital theory with applications to inorganic chemistry.

CH 295 Special Problems in Chemistry. *1-3. F,S,Sum.* Special topics in chemistry at the early undergraduate level. Trial offerings of new or experimental courses in chemistry.

CH 315 Quantitative Analysis. *4(3-3-0) . F,S,Sum. Preq: CH 201.* Fundamental principles and modern techniques of chemical analyses: spectrochemical, electrochemical, volumetric and chromatographic methods of analysis, modern chemical instrumentation, and interpretation of data. Credit is not allowed for both CH 211 and CH 315.

CH (MEA) 323 Earth System Chemistry. *3(3-0-0) . S. Preq: CH 201. Coreq: BIO 125 or any MEA course.* Chemistry of the earth with an emphasis on the interactions of the biosphere, geosphere and atmosphere. The origin and chemical evolution of the solar system, chemical cycles in the environment, and the impact of man on biogeochemical processes.

CH 331 Introductory Physical Chemistry. *4(3-1-0) . F,S,Sum. Preq: CH 201/202; MA 231 or 241, PY 205 or PY 211.* Fundamental physiochemical principles including chemical thermodynamics, physical and chemical equilibrium, electrochemistry and reaction kinetics. For students requiring only a single semester of physical chemistry.

CH 401 Systematic Inorganic Chemistry I. *3(3-0-0) . F,S,Sum. Preq: CH 201.* Descriptive chemistry of the elements with particular attention to their reactions in aqueous solution. Emphasis on the chemistry of the main group elements and the periodicity of their chemical properties. Introduction to transition element and coordination chemistry. Major paper required.

CH 402 Inorganic Chemistry Laboratory. *1(0-3-0) . F,S. Preq: CH 401.* A laboratory program that builds on the knowledge gained in CH 401, for B.S. chemistry majors. Synthesis and characterization of transition metal complexes, including inert atmosphere and high temperature techniques, and spectroscopic and magnetic measurements.

CH 403 Systematic Inorganic Chemistry II. *3(3-0-0) . F,S. Preq: CH 401, CH 431.* Development and application of theoretical principles to the structure and energies of inorganic substances. Particular attention to the chemistry of coordination compounds of the transition elements. Special applications to bioinorganic chemistry,organometallic chemistry, and inorganic solid state chemistry.

CH 415 Analytical Chemistry II. *3(3-0-0) . F. Preq: CH 211 or CH 315 or TC 412. Coreq: CH 416, CH 433.* Methods of quantitative analysis based on electronic instrumentation. Signal processing and electronics, spectroscopy (atomic, x-ray fluorescence, infrared/Raman, surface), voltammetry, chromatography (gas, liquid), mass spectrometry as well as chemical transducers and statistical methods of data handling.

CH 416 Analytical Chemistry Laboratory. *1(0-3-0) . F. Coreq: CH 415.* Experiments in spectroscopy, electrochemistry, chromatography and electronics; computer applications to experimental design and data smoothing.

CH 428 Qualitative Organic Analysis. *3(1-6-0) . F,S. Preq: CH 223.* Introduction to organic chemistry research techniques and to the systematic identification and separation of organic compounds. Application of both physical and chemical procedures. Experimental and research techniques including infrared and nuclear magnetic spectroscopy, chemical classification tests, and the preparation of derivatives.

CH 431 Physical Chemistry I. *3(3-1-0) . F,S,Sum. Preq: CH 201, MA 242, PY 203 or 208. Coreq: MA 341.* An intensive study of physical chemical principles including states of matter, classical thermodynamics, physical and chemical equilibria, and electrochemistry.

CH 433 Physical Chemistry II. *3(3-1-0) . F,S,Sum. Preq: CH 431, MA 341.* An intensive study of physical chemical principles including molecular spectroscopy, statistical thermodynamics, reaction kinetics, kinetic theory, and transport properties. Credit may not be claimed for both CH 433 and CH 437.

CH 434 Physical Chemistry Laboratory. *3(1-4-0) . F,S. Preq: CH 211 or CH 315 or TC412 ; CH 431. Coreq: CH 433.* A project-oriented course to acquaint students with modern physical chemistry laboratory techniques. Experiments in chemical thermodynamics, kinetics, molecular structure and spectra.

CH 435 Introduction to Quantum Chemistry. *3(3-0-0) . F. Preq: CH 431.* An introduction to the basic principles of quantum theory and its application to atomic and molecular structure and spectroscopy.

CH 437 Physical Chemistry for Engineers. *4(4-0-0) . F,S. Preq: PY 208, CHE 315, MA 341.* Selected physiochemical principles including quantum theory, spectroscopy, statistical thermodynamics, and rates of chemical reactions. Credit may not be claimed for both CH 433 and CH 437.

CH 441 Forensic Chemistry. *3(3-0-0) . S. Preq: CH 223, CH 201.* Chemical identification (recognition), and chemical separation techniques (identification) used to demarcate class and individual characteristics relevant in legal claims.

CH 442 Advnanced Synthetic Techniques. *3(1-6-0) . F, S. Preq: CH 223. Coreq: CH 401.* An advanced laboratory class in the synthesis, separation and characterization of organic, inorganic, and polymeric materials. Techniques include reactions under inert atmosphere, column chromatography, fractional distillations, NMR spectroscopy, and other advanced procedures. Scientific writing is emphasized.

CH (TC) 461 Introduction to Fiber-Forming Polymers. *4(3-3-0) . F. Preq: CH 223* . Formation and properties of fiber forming polymers. Step growth and chain growth polymerization. Survey of formation techniques for man-made fibers. Relationship between chemical structure and physical properties of natural and man-made fibers.

CH (MEA) 473 Principles of Chemical Oceanography. *3(3-0-0) . F. Preq: CH 201, MEA 200.* Chemical processes controlling the composition of oceans, including discussions of chemical equilibria, biological cycling of nutrients and use of chemical tracers in marine environment; consideration of origin and chemical history of oceans.

CH 491 Honors Chemistry. *1-4. F,S. Preq: CH 223, Admission to Honors Program.* Independent study and research projects in chemistry.

CH 499 Undergraduate Research in Chemistry. *1-3. F,S,Sum. Preq: Two years of chemistry and Departmental approval required.* Independent investigation of a research problem under the supervision of a chemistry faculty member.

CHEMICAL ENGINEERING

CHE 205 Chemical Process Principles. *4(3-0-2) . F,S. Preq: Grade of C or better in MA 241, PY 205, CH 201.* Engineering methods of treating material balances, stoichiometry, phase equilibrium calculations, thermophysics, thermochemistry and the first law of thermodynamics. Introduction to equation solving packages and spreadsheets for solving problems related to chemical engineering calculations.

CHE 225 Introduction to Chemical Engineering Analysis. *3(3-0-0) . S,Sum. Preq: Grade of C or better in both CHE 205 and MA 242.* Introduction of mathematical and computational tools for analyzing chemical engineering problems. Sequential modular and equation-based simulation of steady-state chemical processes using advanced spreadsheet methods and multivariate root-finding algorithms. Material and energy balances on transient processes and their solution using analytical and numerical methods. Introduction to microscopic material and energy balances using the Sshell balanceS approach to develop the governing differential equations. Solutions to steady-state boundary value problems in heat conduction and Fickian diffusion.

CHE 311 Transport Processes I. *3(3-0-0) . F,S. Preq: Grade of C or better in both CHE 225 and MA 341.* Fundamental aspects of momentum and heat transfer, and the use of these fundamentals in solving problems in transport operations.

CHE 312 Transport Processes II. *3(3-0-0) . F,S. Preq: Grade of C or better in CHE 311.* Fundamental aspects of mass transfer and the use of these basic principles in solving problems in transport operations.

CHE 315 Chemical Process Thermodynamics. *3(3-0-0) . F,S. Preq: Grade of C or better in CHE 225.* Laws of thermodynamics and their application to chemical engineering problems, both in theory and in practice. Criteria of equilibrium in physical and chemical changes. Behavior of real fluids, including mixtures.

CHE 316 Thermodynamics of Chemical and Phase Equilibria. *3(3-0-0) . F,S. Preq: Grade of C or better in CHE 315.* Systematic study of chemical reaction equilibria and phase equilibria. Use of fugacity, activity and chemical potential concepts for predicting the effect of such variables as temperature, pressure on equilibrium compositions. Methods for measuring and estimating thermodynamic properties important to equilibrium calculation in real systems.

CHE 330 Chemical Engineering Lab I. *4(2-4-0) . F,S,Sum. Preq: CHE 311.* Laboratory experiments in unit operations of heat transfer and fluid flow. Laboratory safety, technical report writing, statistics, experimental design, error analysis and instrumentation.

CHE 331 Chemical Engineering Lab II. *2(0-4-0) . F,S,Sum. Preq: CHE 312, CHE 330.* Laboratory experiments in mass transfer and reaction kinetics. Experimental planning, technical report writing and oral presentations are emphasized.

CHE 395 Professional Development Seminar. *1(1-0-0) . F,S.* Professional development and topics of current interest in chemical engineering.

CHE (TE) 435 Process Systems Analysis and Control. *3(3-0-1) . F,S. Preq: (MA 341 and TE 205) or CHE 312.* Dynamic analysis and continuous control of chemical and material engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

CHE 446 Design and Analysis of Chemical Reactors. *3(3-0-0) . F. Preq: CHE 316, Coreq: CHE 312.* Characterization and measurement of the rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors. Credit cannot be received for both CHE 446 and CHE 546.

CHE 450 Chemical Engineering Design I. *3(3-0-0) . F. Preq: CHE 312.* Applications of cost accounting, cost estimation for new equipment, manufacturing cost and measures of profitability. Use of computer simulation design and cost programs. Procedures for sizing unit operations commonly encountered in the chemical process industry. Heuristics for selection of separation processes and heat exchanger network synthesis.

CHE 451 Chemical Engineering Design II. *3(2-0-2) . S. Preq: CHE 450, CHE 446.* Chemical process design and optimization. The interplay of economic and technical factors in process development, site selection, project design, and production management. Comprehensive design problems.

CHE (MAT, MSE) 455 Polymer Technology and Engineering. *3(3-0-0) . F. Preq: MSE 425.* This course will cover commercial polymers, polymer blends and miscibility, dynamic mechanical behavior, Boltzmann superposition principle, ultimate properties of polymers, polymer rheology and processing, recycling and design and selection of polymeric materials. Guest instructors from industry will give presentations on contemporary topics in polymer technology and engineering. Field trips are required.

CHE 460 Chemical Processing of Electronic Materials. *3(3-0-0) . S, Alt.yrs. even. Preq: CHE 311 and CHE 315.* Plasma and thermal inorganic chemical processes in semiconductor device fabrication. Thin films and electronic devices. Kinetics and chemical transport in electronic materials synthesis, modification and etching. Plasma physics and chemistry, reactors and process diagnostics. Credit for both CHE 460 and CHE 760 is not allowed.

CHE 461 Polymer Sciences and Technology. *3(3-0-0) . F. Preq: CH 223, CHE 316.* Concepts and techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.

CHE 462 Colloidal and Nanoscale Engineering. *3(3-0-0) . S (Alt. yrs, odd). Preq: Grade of C- or beter in CHE 311 & CHE 315.* The first part of this course will present the fundamentals of nanoscale colloidal processes, including interactions and self-assembly of particles, surfactants and biomolecules. The applications of these fundamentals to the nanotechnology and engineering on the nanoscale will be discussed. The nanoscience has led to the development of many new technologies with relevance to chemical engineering, including microfluidics, lab-on-a-chip, bioarrays and bioassays. These emerging technologies will be presented and discussed in the second half of this course.

CHE (BIT) 463 Fermentation of Recombinant Microorganisms. *2(2-5-0) . S. Preq: BIT 360 or BIT 810 or MB 409 or BCH 454 or ZO 480.* Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first half.

CHE (BIT) 464 Protein Purification. *2(2-5-0) . S, Alt. Yrs. (even). Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Comparison of several different chromatography techniques for protein purification. Construction of purification tables and SDS-and native-PAGE analysis. Cost-benefit analysis of industrial-scale procedures. Half semester course, second part.

CHE 465 Diffusion in Polymers. *3(3-0-0) . S. Preq: CHE 461/543.* The theory of small molecule transport in polymers; application of membrane transport processes in the chemical, polymer, textile, coatings and natural fibers industries. Credit will not be given for both CHE 465 and CHE 565.

CHE 467 Polymer Rheology. *3(3-0-0) . S. Preq: CHE 311.* Theoretical principles and experimental techniques associated with flow and deformation of polymer systems. Systems include: melts and solutions, suspension, gels, emulsions, and thixotropic materials.

CHE 469 Polymers, Surfactants, and Colloidal Materials. *3(3-0-0) . S. Preq: CHE 316, CH 223.* Relationships between molecular structure and bulk properties of nonmetallic materials applied to commercial products and chemical engineering processes. Applications of surface and colloidal chemistry and polymer science to product development andprocess improvement. Credit will not be given for CHE 469 and CHE 769.

CHE 475 Advances in Pollution Prevention: Environmental Management for the Future. *3(3-0-0) . S. Preq: PY 208, MA 341.* Design of industrial processes which minimize or eliminate wastes. Regulations and the corporate organization of current pollution prevention efforts. Current pollution prevention research. Product life cycle analysis and the application to design of more efficient processes.

CHE 476 Life Cycle and Sustainability Concepts for the Environment. *3(3-0-0) . F.* Students in this course will learn the principles and constraints of the emerging life cycle field applied to manufacturing and environmental issues. The goal is to provide a basic understanding, an exposure to the current state-of-the-art, and experience in life cycle development. The content and participation in this course should provide the student with new and versatile principles for the management of manufacturing, environment and the supply chain. The applications to and principle ofsustainability will also be taught.

CHE 495 Honors Thesis Preparation. *1(1-0-0) . S. Preq: CHE 497, Senior standing.* Development and presentation of Honors Thesis in Chemical Engineering and discussion of graduate school selection and preparation.

CHE 497 Chemical Engineering Projects I. *3(0-12-0) . F,S,Sum. Preq: Senior standing.* Introduction to chemical engineering research through experimental, theoretical and literature studies. Oral and written presentation of reports.

CHE 498 Chemical Engineering Projects II. *1-3. F,S,Sum. Preq: Senior standing.* Projects in research, design or development in various areas of chemical engineering.

COLLEGE OF NATURAL RESOURCES

CNR 110 Forest Resources Scholars Forum. *0(2-0-0) . F,S. Preq: Student in Scholars Program.*

CNR 111 Forest Resources Scholars Forum. *0(2-0-0) . F,S.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

CNR 210 Forest Resources Scholars Forum. *0(2-0-0) . F,S. Preq: Student in Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

CNR 211 Forest Resources Scholars Forum. *0(2-0-0) . F,S. Preq: Student in Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

CNR 490 Senior Honors Seminar. *2(2-0-0) . S. Preq: 4 credit hours of Independent Study.* Oral presentations of the results of the senior honors projects. Additional special seminars and group discussions to enrich and broaden student perspectives.

COMMUNICATION

COM 103 Introduction to the Theater. *3(3-0-0) . F,S,Sum.* Artistic, technical, historical, and literary areas of theater, including acting, directing, design, stagecraft, lighting, costuming, makeup, and criticism.

COM 110 Public Speaking. *3(3-0-0) . F,S,Sum.* Research skills, topic selection, speech organization, skills in speech delivery. Listening for analysis and evaluation of in-class speech presentation.

COM 112 Interpersonal Communication. *3(3-0-0) . F,S,Sum.* Interpersonal communication competence: self-concept, self-disclosure, active listening, verbal and nonverbal communication, and conflict management.

COM 201 Introduction to Persuasion Theory. *3(3-0-0) . F,S,Sum.* Impacts of persuasive communication on attitudes and behavior. Uses humanistic and social scientific theories to explain the persuasive process.

COM 202 Small Group Communication. *3(3-0-0) . F,S.* Theory and practice of effective communication in small groups, including: stages of group development, role emergence, leadership functions, decision making strategies, conflict management, and the significance of power.

COM 203 Theory and Practice of Acting. *3(3-0-0) . F,S,Sum.* Basic contemporary theories on acting, with practical application through classroom exercises. Role analysis, adaptation of voice and body to performance demands, and role development through various rehearsal activities.

COM 211 Argumentation and Advocacy. *3(3-0-0) . F,S.* Theory-based analysis of public argument in specialized settings of law, politics, academic debate, business and organizations, and interpersonal relations.

COM 213 Oral Interpretation of Literature. *3(3-0-0) . F,S.* Selection, preparation, and oral performance of literature for specific audiences of adults and children.

COM 215 Introduction to Communication Disorders. *3(3-0-0) . F,S.* Normal speech/language development including the anatomical and physiological bases for reception and expression of oral language. Developmental and acquired speech/language problems and basic treatment principles applied to communication disorders.

COM 223 Stagecraft. *3(3-0-0) . F,S.* Fundamentals of scenery design, set construction, and related technical activities. Practical applications with use of design media and shop facilities. Required production participation in University Theater presentations.

COM 226 Introduction to Public Relations. *3(3-0-0) . F,S,Sum.* Public relations as a communication function of organizations. Public relations process, principles, history, and practice. Analysis of environmental, organizational, communication, and audience influences on public relations practice; career opportunities.

COM 230 Introduction to Communication Theory. *3(3-0-0) . F,S. Preq: Communication Majors.* Micro- and macro-analytic theories used in the study of human communication: perspectives and assumptions of major theories; utility and application of major theories; contexts, cultures, and media.

COM 233 Introduction to Stage Lighting. *3(2-2-0) . F.* Fundamentals and uses of stage lighting equipment and stage lighting design. Practical application of design media and shop facilities. Participation in production activity for University Theater presentations.

COM 240 Communication Inquiry. *3(3-0-0) . F,S. Preq: COM 230 ; Communication Majors.* Qualitative and quantitative methods of inquiry in communication: types of questions; strategies for answering questions; nature of evidence; advantages and disadvantages of different methods; reference tolls in the field; and channels of distribution for research-based information.

COM 250 Communication and Technology. *3(3-0-0) . F,S. Preq: COM 240 ; Communication Majors.* Examination of past and current intersections of technology, culture, and communication. Implications for future intersections. Impact of technology and communication policy. Methods of message evaluation. Exposure to technology applications in the discipline. Basic technology skills for the competent communicator. Practical experience in interactive communication technology.

COM 257 Media History and Theory. *3(3-0-0) . F,S. Preq: COM 230.* Historical development and social implications of telecommunications, print, photography, film, broadcasting, and computer-mediated communication. Theoretical and methodological approaches to the field of communication media: media history; media economics and policy; media effects and power; media as producers of meaning; media audiences; media technologies; and roles of the media in social, cultural, and political change.

COM 267 Electronic Media Writing: Theory and Practice. *3(3-0-0) . F,S,Sum. Preq: COM 230.* Media writing as a social practice. Roles of writing and writers in media production processes. Social, political, economic, and professional conditions that enable or constrain writing and the writer. Specific media writing genres and formats. Research and preparation for media writing. Students write research-based scripts for news, commentary, and fictional genres in radio, television, film, and emerging media.

COM 293 Theater Practicum. *1-6. F,S,Sum.* Practical experience in one or more of the various areas of artistic and technical theater through active participation in Thompson Theater's play production program.

COM 296 Communication Internship-Non-Local. *S. Preq: Communication Majors.* Non-local directed work experience for Communication majors with supervision from the work site and the University. COM 296 may be taken more than once only with the permission of the Internship Director and the Assoc. Dept. Head.

COM 298 Special Projects in Communication. *1-3. F,S.* A special projects course to be utilized for guided research or experimental classes at the sophomore level, topic determined by instructor.

COM 301 Presentational Speaking. *3(3-0-0) . F,S. Preq: COM 110.* Design, organization and delivery of oral presentations for policy determination, policy implementation, and sales.

COM 302 Managing Meetings. *3(3-0-0) . F.* Rules and customs of meetings in committees, assemblies and organizations; meeting management and group leadership; parliamentary motions and strategies.

COM 303 Stage Directing. *3(3-0-0) . S.* Basic theory of directing and its application to theatrical production. Play reading, evaluation, casting procedure, staff organization, and rehearsal planning and practices. Laboratory productions of short plays.

COM 307 Digital Audio Production. *3(1-4-0) . F,S. Preq: COM 267.* Basic principles of digital audio production, including studio operation, performing, writing and producing.

COM 314 Advanced Audio Production. *3(1-4-0) . S. Preq: COM 214.* Advanced multichannel techniques for audio production. Studio acoustics, audio signal processing, and advanced microphone techniques, writing, and performing.

COM 315 Phonetics. *3(3-0-0) . S.* Articulatory and acoustic phonetics; application of the International Phonetic Alphabet with vocal and ear training.

COM 316 Communication Techniques for Public Relations. *3(3-0-0) . F,S. Preq: COM 226.* Communication processes and procedures of public relations programs. Media techniques, preparation of materials, channels of distribution.

COM 317 Television Production. *3(1-4-0) . F,S. Preq: COM 267.* Basic techniques of television studio production, including producing, writing, directing and electronic graphics production.

COM (ENG) 321 Survey of Rhetorical Theory. *3(3-0-0) . F. Preq: COM 201.* Principles of rhetorical theory from its classical origins through the modern period to the present time. Key concepts and theories that provide a critical understanding of the processes of persuasive symbol use.

COM 322 Nonverbal Communication. *3(3-0-0) . F,S. Preq: COM 112.* Theory and research in nonverbal communication, including: environment; space; physical appearance, movement; eyes and facial expressions; and vocal cues. Nonverbal communication in personal, workplace and cross-cultural setting.

COM 323 Introduction to Scenic Design. *3(2-2-0) . S, Alt. yrs.. Preq: COM 103 or 223.* Aesthetics, elements, and principles of scenic design. Theories and applications to the physical stage in relation to the script. Practical applications with the use of design media in University Theater productions.

COM 325 Anatomy and Physiology of Speech. *3(3-0-0) . F.* Anatomy and physiology of the speech mechanism including the muscular, skeletal, and nervous system structures involved in respiration, phonation, and articulation.

COM 327 Critical Analysis of Communication Media. *3(3-0-0) . F,S. Preq: COM 240 and COM 257. Coreq: COM 240.* Theoretical frameworks, methods, and aims of various approaches to critical analysis of the media. Critiques of power over media production; social biases of informational, fictional, and hybrid media content; and historical forms of audiences and the public. Critical awareness of the media's effects in politics, public culture, and everyday life.

COM 332 Relational Communication. *3(3-0-0) . F,S. Preq: COM 112.* Communication patterns in the development and deterioration of interpersonal relationships. Functional and dysfunctional communication behaviors in family relationships.

COM 333 Advanced Acting. *3(3-0-0) . S, Alt yrs. Preq: COM 203 or demonstrated competence in acting.* Advanced methods in role preparation through exercises in concentration, imagination, sensory and emotional recall, and other Stanislavskian techniques. Analyses and critiques of plays and in-class performances.

COM 335 Language Development. *3(3-0-0) . F, Alt yrs.* Syntactic, semantic, morphologic, and pragmatic development from birth through adolescence. The influence of cognitive and social development on language development. First language acquisition versus second language learning.

COM (AFS) 340 African American Theatre. *3(3-0-0) . S.* This course examines African American dramaturgy and its impact on American theatre. We will study plays from the early period, 1847-1938, and from the recent period, 1935-present. This course will investigate the thematic structure of each section of plays including family life, social protest, and religion. The course will also help students to better understand the social milieu that shaped the content of each play.

COM 342 Interviewing. *3(3-0-0) . F,S. Preq: Junior standing.* Theory and practice of effective communication skills applied in various types of professional interviews. In-class interviewing.

COM 344 Film Production. *3(2-2-0) . F. Preq: COM 267.* Principles of cinematography, production, and editing technologies for film. Script, shoot, and edit short 16mm films. Post-production on digital non-linear editing systems. Critical analysis of production of classic and contemporary feature films.

COM 345 Child Language Disorders. *3(3-0-0) . S. Preq: COM 335.* Basic principles, methods and procedures for assessment and intervention of child language disorders. Dialectical differences. Research methodology. Computer applications.

COM 357 Digital Video Production. *3(2-2-0) . F,S. Preq: COM 267.* Principles of producing, directing, and editing techniques for digital video. Students script, storyboard, shoot, and edit short video projects.

COM (WGS) 362 Communication and Gender. *3(3-0-0) . F,S. Preq: Junior standing, COM 112.* Effects of gender on the interpersonal communication process. Construction of gendered identities via communication practices. Examination of theories of gender and the role of gender in organizational, institutional, and media communication practices.

COM (ENG) 364 History of Film to 1940. *3(3-0-0) . F. Preq: Junior standing.* Technological developments and aesthetic movements that shaped cinema production and direction from the beginning of the industry to 1940. Evolution in camera movement, editing, sound storyline, and the documentary. Rise to prominence of the Hollywood studio systems and the contributions of foreign filmmakers.

COM 367 Multimedia Production and Digital Culture. *3(2-2-0) . S. Preq: COM 267.* Production lab and seminar combined. .Digital production of visual images, audio, and video for the web. Readings in theories of visual communication and electronic culture. Critical analysis of assumptions underlying development and deployment ofelectronic media, and their social, economic and political impact. Development of practical skills and critical thinking.

COM (ENG) 374 History of Film From 1940. *3(3-0-0) . S. Preq: Junior standing.* Technological developments and aesthetic movements that have shaped cinema production and direction from 1940 to the present. Evolution in camera movement, editing, sound, storyline, and the documentary. Post-war decline and re-emergence of the Hollywood film industry and the contributions of foreign filmmakers.

COM 375 Articulation and Phonological Development and Disorders. *3(3-0-0) . F. Preq: COM 215.* Normal acquisition of articulation and phonology. Basic principles and methods of assessment, diagnosis, and treatment of articulation and phonological disorders. Dialectal differences. Phonological transcription. Computer applications.

COM 377 Television Writing Seminar. *3(3-0-0) . F. Preq: COM 204.* Development of advanced skills in writing for television in such formats as news, documentary, commercials and public service announcements, drama and non-broadcast video. Discussions with working professionals.

COM 385 Speech Science. *3(2-2-0) . S. Preq: COM 215 and COM 325.* Acoustic properties of speech sounds and the dynamics of speech sound production. Initial experience with basic clinical instrumentation used to measure respiratory, phonatory, and articulatory movements and the acoustic events that result from these movements. Lab assignments using basic instrumentation and computer software are completed outside of class.

COM 387 Advanced Television Production. *3(1-4-0) . S. Preq: COM 224.* Television program production utilizing advanced production techniques. Emphasis on refinement of writing, producing, and directing skills through work in TV studio on production of sophisticated program formats.

COM (HSS) 392 International and Crosscultural Communication. *3(3-0-0) . S.* Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics and crosscultural communication. Impact on communication of differing cultural perspectives.

COM 402 Advanced Group Communication. *3(3-0-0) . S. Preq: COM 202.* Communication processes and outcomes in groups with complex, strategic, and critical public or corporate functions. Focus on participating in, intervening in, leading, and constructing group processes. Advanced theory with application.

COM 403 Touring Theatre. *3(1-4-0) . S. Preq: Audition required.* A touring performance experience consisting of text analysis, characterization, role development, and performance of scripts.

COM (ENG) 411 Rhetorical Criticism. *3(3-0-0) . S.* Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramatistic analysis, content analysis, fantasy theme analysis.

COM 415 Diagnostic Procedures in Speech Pathology. *3(3-0-0) . S. Preq: COM 215 plus six (6) additional credits in communication disorders courses.* Principles and practices of assessment. Models and procedures used in diagnosing a wide variety of communication disorders in children and adults. Critical analysis and diagnosis of voice, fluency, hearing, articulation and phonological language, and neuropathic disorders. Diagnostic report writing.

COM 417 Advanced Topics in Communication and Race. *3(3-0-0) . F,S. Preq: COM 257. Coreq: COM 250.* Advanced topics seminar examining construction of racial and ethnic identities through communication practices. Exploration of theories of race and identity and the ways communication works to construct, undermine, and reinforce understanding across social groups.

COM 421 Communication Law. *3(3-0-0) . F. Preq: Junior standing.* Explores the historical, philosophical, and legal foundations of communication rights and responsibilities. Philosophies and regulations affecting sources, messages, channels, receivers, and situations provide the central focus of the course.

COM 431 Communication in Political Campaigns. *3(3-0-0) . F, Alt. yrs., Preq: COM 110 or COM 201.* Roles of analysis and criticism of oral communication in political campaigns; analysis of special political communication situations; ghostwriting, news conferences, negative advertising.

COM 435 Audiology. *3(3-0-0) . S. Preq: LCD Majors.* Basic terminology in audiology; anantomy and physiology of the ear; types of hearing loss; evaluation of hearing using air and bone conduction, speech audiometry, tympanometry, and acoustic reflexes; interpretation of audiograms. Performance of hearing screening and air condustion threshold testing.

COM 437 Advanced Digital Video. *3(0-6-0) . S. Preq: COM 357.* Hands-on experience in digital video production. Production of instructional videotapes. Practical experience in all phases of production process, including pre-production organization and critical analysis of final product.

COM 441 Ethical Issues in Communication. *3(3-0-0) . S. Preq: COM 110, 112.* Critical analysis of ethical problems in interpersonal and public communication practices.

COM 442 Communication and Conflict Management. *3(3-0-0) . F. Preq: COM 112.* Examination of conflict styles and theories; conflict management strategies such as negotiation and third party intervention; and relevant contexts for conflict such as workplace, families, and interpersonal relationships. Practical, theoretical and critical analyses of conflict and negotiation in variety of contexts.

COM 444 Television Writing Seminar. *3(3-0-0) . F. Preq: COM 204.* Development of advanced skills in writing for television in such formats as news, documentary, commercials and public service announcements, drama and non-broadcast video. Discussions with working professionals.

COM 445 Neurolinguistic Development and Disorders. *3(3-0-0) . F,S. Preq: COM 335.* Neuroanatomy and physiology basic to the diagnosis and treatment of children and adults with neurolinguistic disorders related to traumatic brain injury, aphasia and neurological disease. Survey of etiology and symptomatology. Training in the nature, characteristics, associated problems, and clinical management of patients with brain damage.

COM 446 Problems in Public Relations. *3(3-0-0) . F,S,Sum. Preq: COM 226 and COM 230.* Application of theory, principles, and problem-solving techniques used in public relations to organizational case studies.

COM 447 Communication and Globalization. *3(3-0-0) . F, Alt yrs(odd). Coreq: COM 327.* History and current trends in globalization of media, information, and telecommunications technologies, organizations, policies, and contents. Political cultural implications of globalization, including debates over corporate vs. public control of global communication, U.S. dominance vs. international cooperation, and the global influence of American culture. Internet-based group research projects on globalization in collaboration with students in other countries.

COM 455 Clinical Observation in Speech-Language Pathology. *3(3-0-0) . F,S. Preq: COM 215.* Observation of a variety of therapy techniques and clinical procedures used in the treatment of speech-language-hearing-impaired individuals in the NC State Speech Clinic and other local sites.

COM 456 Organizational Communication. *3(3-0-0) . F,S,Sum. Preq: COM 230.* Role of human communication in organizations, the assumptions inherent in management philosophies about effective communication, and an investigation of the relationships among communication, job satisfaction, productivity, development, and employeemotivation.

COM 457 Media and the Family. *3(3-0-0) . F. Coreq: COM 327.* Impact of mediated messages upon children and the family unit. Origins of the empirical literature and continuing research. Assessment of the qualitative literature. Implications of commercial structure of the media industries on the structure and distribution of media messages designed for children and families. Consideration of both pro- and anti-social impacts.

COM 462 Cross-Cultural Communication. *3(3-0-0) . F. Preq: COM 112; 3 additional COM credits.* Communication across cultural boundaries with emphasis on comparative analysis of communication strategies and tactics as well as overall communication systems of various cultures: problems, barriers, patterns of communication.

COM 465 Advanced Clinical Practicum in Speech-Language Pathology. *3(3-0-0) . F,S. Preq: COM 455.* Initial experience for students to assess and treat individuals with speech, language, and hearing problems and to write clinical reports.

COM 466 Nonprofit Leadership & Development. *3(3-0-0) . S.* Nonprofit Leadership and Development is a service-learning course in which students will be expected to make a 20-hour commitment to service in a local nonprofit organization. Students will critically examine theories of communication and leadershipwith concentration on issues pertaining to nonprofits such as working with executive boards, volunteer management, and resource development. Students are responsible for transportation and purchase of internship insurance.

COM 467 Advanced Topics in Gender and Communication. *3(3-0-0) . F,S. Preq: COM 327 or COM 362.* Advanced Topics seminar examining construction of gender identities through communication practices. History and analysis of gender representations. Theoretical and critical approaches to social, political, and economic impact of gender constructions.

COM 474 Video in Business and Industry. *3(3-0-0) . S. Preq: COM 224 or COM 354.* Planning and controlling the use of video for training, employee communication, public relations, and other purposes in organizations. Applications, organizational variables, and technologies.

COM 476 Public Relations Applications. *3(3-0-0) . F,S. Preq: COM 446, COM 486.* Management of the public relations function in organizations and public relations counseling; communication theory and nature of materials emanating from public relations departments and counseling firms, practical analysis and development of public relations publicity and campaigns.

COM 486 Communication Research Methods. *3(3-0-0) . F,S. Preq: COM 240.* Design and implementation of communication research methods, including experimental and survey research procedures. Use of computer software for statistical analysis.

COM 487 Internet and Society. *3(3-0-0) . F. Preq: COM 230 and COM 257.* Exploration of major issues involved in the growth of computer-mediated communication and information technologies. Construction of self and body; relation of information technology to social, civic, and political life; gender, race, and class as continuing critical points; knowledge and intellectual property; the implications of software and design on the nature of communication, knowledge, and information.

COM 493 Audition and Interpretation Techniques. *3(3-0-0) . F,S.* Cold-reading scenes broken down to meet challenges of theatrical auditions. Personal technique developed to interpret tests through exercises, monologues,

and scenes. Promotion of self-awareness, confidence, and understanding of dramatic literature as reflector of contemporary and historic lives.

COM 496 Communication Internship. *3(3-0-0) . F,S. Preq: Junior standing, Communication Majors, Departmental approval required.* Directed work experience for Communication majors with supervision from the work site and the University.

COM 498 Advanced Topic in Communication. *1-3. F,S. Preq: Nine hours of communication courses, Junior standing.* Advanced study of contemporary theories, methods, practices, processes, or issues related to the field of communication. Topic varies.

COM 499 Advanced Independent Study in Communication. *1-3. F,S. Preq: Nine credits in Communication courses. Junior standing or Senior standing in Communication.* Special projects in communication developed under the direction of a faculty member on a tutorial basis. Must have permission of department to enroll. May enroll only twice.

CROP SCIENCE

CS 103 Introduction to Crop Science. *1(1-0-0) . F.* Introduction to the scope, purpose, and objectives of a university education with an emphasis on areas related to crop science. Students will explore college and departmental resources, academic policies and procedures, the agricultural industry, career opportunities, and current trends and issues in agriculture. Students cannot receive credit for both CS 103 and ALS 103.

CS 200 Introduction to Turfgrass Management. *4(3-2-0) . F. Preq: BIO 181(preferred) or ZO 160(alternate) BO 200, or CS 213.* Turfgrass selection, establishment, maintenance, and pest management in lawns, golf courses, athletic fields, and roadside care; Emphasis on understanding the impact of the environment on management practices and turfgrass performance. Field trips in laboratory.

CS 210 Lawns and Recreational Turfgrass. *3(3-0-0) . F,S,Sum.* Utilization of turfgrasses for lawns and recreational areas. Emphasis on: the cultural and environmental benefits of grassed areas, concepts of grass growth and development, selecting adapted grasses for proper use, techniques for successful establishment and management of cool-and-warm-season turfgrasses, fertilization, irrigation, aeration, and pest management. The history and benefit of natural and artificial sports fields will also be discussed. Credit will not be awarded for both CS 200 and CS 210.

CS 211 Plant Genetics. *3(2-0-2) . S. Preq: BIO 183, or ZO 160.* Fundaments of plant genetics. Genetic basis for plant improvement. Genetic analysis of Mendelian traits, molecular structure and organization of genetic material, crop biotechnology, distribution and behavior of genes in populations.

CS 213 Crops: Adaptation & Production. *4(3-2-0) . F,S. Preq: BIO 181(preferred) or ZO 160(alternate) or BO 200.* Fundamental structure and reproductive features of crops. Their adaptation and importance in global agriculture. Practices and inputs needed for economic production of a quality product and interaction of these factors within the constraints of climate, soils, and topography in maintaining a quality environment.

CS 230 Introduction to Agroecology. *3(3-0-0) . F. Preq: BIO 105 or BIO 181 or BIO/ZO 160 or BO 200 or BO 250 or HS 201 or CS 213.* This course will examine the biological and physical attributes of farming systems and their associated ecological and social impacts in temperate and tropical regions. It will address the ecological consequences of indigenous food and fiber production systems, conventional agricultural systems and $alternative$ systems that incorporate biological pest control and natural nutrient inputs. Students will examine several case studies that integrate their understanding of concepts.

CS 312 Grassland Management for Natural Resources Conservation. *3(2-2-0) . F. Preq: BIO 181(preferred) or ZO 160(alternate) CS 213, SSC 200.* Basic principles and practices of production and utilization of pasture and forage crops; impact on developing sustainable systems for livestock feed, soil and water conservation; use of computers to assist in whole farm planning and information retrieval.

CS 400 Turf Cultural Systems. *3(3-0-0) . F. Preq: CS 200, BO 200, SSC 200.* Topics include: golf course design considerations, fertilizer characteristics and application techniques, irrigation programming, construction of high use turfgrass areas, calibration of spreaders and sprayers, aerification, pesticide fate and development of effective management systems.

CS 411 Crop Ecology. *3(3-0-0) . F. Preq: BO 421.* Ecology and production of major agronomic crops of economic importance. Impact of key environmental stress factors on production processes and management strategies. Environmental issues pertaining to sustainable cropping systems. Manipulation of canopy climate and rooting environment for enhanced crop performance in the context of global climate change. Ecological analysis of abiotic - and biotic-derived crop disorders.

CS 413 Plant Breeding. *2(2-0-0) . S. Preq: GN 411 or ANS 215.* Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties.

CS 414 Weed Science. *4(3-2-0). F. Preq: CH 220.* History, current status and fundamentals of weed biology and cultural, biological, and chemical weed control; properties and uses of herbicides; weed identification; proper use of herbicide application equipment; current weed management practices incrops and non-cropland situations.

CS 415 Integrated Pest Management. *3(3-0-0) . F. Preq: BIO 181(preferred) or ZO 160(alternate) or BO 200 or BO 250.* History, principles, and application of techniques for managing plant pests. Theory and practice of integrating pest control tactics to manage pests within economic, environmental, and sociological constraints. Topics include pest monitoring methodology, economic aesthetic thresholds, biological control, efficient pesticide use, biotechnology, and global positioning systems.

CS 424 Seed Science and Technology. *3(3-0-0) . S. Preq: CH 220 or CH 221 and BO 321 or BO 421 or FOR 303.* The uniqueness and basic uses of seeds, formation, development, germination, quality factors and production of agronomic, horticultural, turf, and forage seeds, environmental impact on seed development, seedling survival and stand establishment, seed dormancy and its impact on weed seed survival in cultivated and undisturbed soil.

CS 430 Advanced Agroecology. *4(3-3-0) . S.* This course applies agroecological principles introduced in CS 230 and critical thinking to evaluate various agroecosystems. Students will examine food, fiber, and other commodity production systems for security, productivity, and sustainability and address the simultaneous need to protect natural environments and the biodiversity on which agroecosystems depend. Topics include discussion of national and international government policies, research programs, and education programs that influence the future application of agroecosystem principles.

CS (BAE, SSC) 440 Geographic Information Systems in Production Agriculture. *3(2-2-0) . S. Preq: SSC 341.* Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

CS (SSC) 462 Soil-Crop Management Systems. *3(3-0-0) . S. Preq: CS 213, CS 414, SSC 342, SSC 452, Senior standing.* Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical studies in planning and evaluation of soil and crop management systems.

CS 465 Turf Management Systems and Environmental Quality. *3(3-0-0) . F. Preq: CS 400.* Integration of turfgrass management systems and the use of BMPs and IPM to protect environmental quality. Examination of water quality issues relative to turf. Application of Best Management Practice and Integrated Pest Management strategies. Credit cannot be received for both CS 465 and CS 565.

CS (SSC) 490 Senior Seminar in Crop Science and Soil Science. *1(1-0-0) . S. Preq: Senior standing in Agronomy.* Review and discussion of current topics in crop science, soil science, agronomy and natural resource management. Preparation and presentation of scientific information in written and oral format.

CS 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

CS 493 Special Problems in Crop Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer the departmental teaching coordinator and the academic dean prior to the experience.

CS 495 Special Topics in Crop Science. *1-6. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

DESIGN

D 100 Design Thinking. *2(2-0-0) . S. Preq: DF 101. Coreq: ADN 102 or ARC 102 or GD 102 or ID 102 or LAR 102.* Design topics including: processes, methods, philosophies, theories and special topics such as making choices in a consensus driven organization or in a collaborative venture. A companion course to the second semester discipline specific Fundamental Studios.

D 231 Design History for Engineers and Scientists. *3(3-0-0) . F,S.* Study of historical connections among various disciplines and across cultures from prehistory to the present, with an emphasis on design. Students develop visual timelines of events to better understand how seemingly disparate disciplines affect one another. Special attention paid to scientific, artistic, and philosophical $revolutions$ and their impact upon each other and upon other intellectual and practical endeavors.

D 292 Special Topics in Design. *1-3. F,S,Sum.* Topics of current interest in the college of Design. Used to develop new courses.

D 492 Special Topics in Design. *1-6. F,S,Sum.* Topics of current interest in the College of Design. Used to develop new courses.

DANCE

DAN (PE) 264 Ballet. *1(0-2-0) . F,S.* Beginning level ballet technique course. Fundamental ballet concepts and vocabulary introduced through barre and center exercises and combinations.

DAN 272 Dance Composition. *1(0-2-0) . F,S. Preq: PE 264 or PE 274.* Creative problem-solving using the components of movement composition. Development of movement vocabulary through structured improvisation. Development of a thematic phrase. Manipulation of the thematic phrase through various choreographic devices. Structure of the developed materials.

DAN (PE) 274 Modern Dance I. *1(0-2-0) . F,S.* Introduction of movement and dance concepts and techniques through theory and analysis, improvisation and composition, structured dance exercises combinations.

DAN (PE) 275 Modern Dance II. *1(0-2-0) . F,S. Preq: PE/DAN 274.* Continuation of Modern Dance I. Emphasis on design of body in space, movement qualities and musicality through structured technical exercises and combinations.

DAN 295 Problems of Dance Performance. *2(0-4-0) . F,S. Preq: Audition.* Practical performing experience in a company setting. Rehearsal, performance and production of concert dance.

DAN 498 Independent Study in Dance. *1-3. F,S,Sum. Preq: DAN 272, Dan 295, Dance Program approval required..* Independent study in special choreographic or performance projects approved by and done under the direction of the Dance Program.

DESIGN FUNDAMENTALS

DF 101 Design Fundamentals Studio I. *6(0-11-0) . F. Preq: Design Majors.* Introduction to the design disciplines and departments of the College of Design. A studio course examining the techniques and attitudes for dealing with identification, solution and evaluation of problems arising from the design of physical artifacts in the natural and built environment. The design studio process includes the acquisition of languages and skills appropriate to design studies.

DESIGN STUDIES

DS 101 History of Design I, From Before the Apple to Xia Gui. *3(3-0-0) . F.* DS 101 covers the history of design from caves and 'rude stone monuments' through the Renaissance. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures, while providing insight into the impact of early design on later periods of art and design. Required for all Design Studies majors. 15 seats per year will be reserved for Design Studies majors.

DS 102 History of Design II: From Xia Gui to Newton's Cenotaph. *3(3-0-0) . S. Preq: DS 101 for DS Majors, None for Non-Majors.* DS 102 covers the history of design from the 1200s through the 1700s. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures. Required for all Design Studies majors. 15 seats reserved for Design Studies majors.

DS 203 History of Design III: From Newton's Cenotaph to After Apple. *3(3-0-0) . S. Preq: DS 102 for DS Majors; None for Non-Majors.* DS 203 covers the history of design from the Industrial Revolution to the present day. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures. Required for all Design Studies majors. 15 seats per year will be reserved for Design Studies majors.

DS 244 Material Culture and Industrial Design. *3(3-0-0) . S.* DS 244 covers the history of technology and industrial design. The course is divided into three major units: technology, design, and materials before the industrial revolution; the impact of the industrial revolution; and current and future developments of the field. Required for all Design Studies majors. 15 seats reserved for Design Studies majors.

DS 251 History of Aesthetics I, From the Pre-Socratics throughout the Renaissance. *3(3-0-0) . S. Preq: None for Non-Majors; DS 203 for DS Majors ; Open university wide, but preference given to Design Studies Majors.* This course examines in depth and from a cross-disciplinary perspective the history of aesthetics from Plato through the Renaissance. The course focuses on Plato's theory of Beauty and compares it to Aristotle and follows this tradition through the middle ages and the Renaissance. Additionally, time will be spent looking at and studying artifacts from various periods in light of aesthetic theories.

DS 352 History of Aesthetics II, Seventeenth and Eighteenth Centuries. *3(3-0-0) . F. Preq: DS 251 ; Open university wide, but preference given to Design Studies Majors.* This course examines the nascent period of modern aesthetic theory. Beginning with Newton's science and Locke's epistemology, it looks at how this arid, mathematical, and additive view of the physical world and the imagination altered over the course of the eighteenth century to the entirely new vision of the Romantics, engendered by a century of reaction to Locke and systemized by Immanuel Kant, who saw the physical world as fecund and the imagination as a faculty more significant that reason.

DS 353 History of Aesthetics III, Nineteenth Century. *3(3-0-0) . S. Preq: DS 352 ; Open university wide, but preference given to DS Majors.* Beginning with Kant's notion of the imagination the course examines the Idealist tradition in Germany and the rise of the Romantic Movement throughout the Western World. We will also look at opposing traditions including the empirical and scientificradition supported by the Darwinian Revolution. The course also draws on previous courses in aesthetics to see how early theories of the arts are transformed during the nineteenth century in light of the industrial revolution and the revolutions inscience.

DS 360 Iconography. *3(3-0-0) . S. Preq: DS 251 ; Preference given to Design Studies Majors..* This course is designed to familiarize the student with standard iconography used in both the various fine arts and in design. Students will study Greek, Roman, and Christian pictorial motives and their allegorical meanings. Additionally, students will examine how design artifacts have symbolic meaning without directly using mythological or religious symbols. The topic will then be extended to the present day use of signs and symbols in art, buildings, and various design products.

DS 454 History of Aesthetics IV, Twentieth Century. *3(3-0-0) . F. Preq: DS 353 ; Open University wide, but preference given to Design Studies Majors..* This course examines the rise of Modern Aesthetics. The course analyzes the effects of nineteenth century science on aesthetic theory, and opposing metaphysical theories. Of significant importance to the course will be the contributions of Cassirer and Panofsky's Philosophy of Symbolic Form. The idea of Modernism, as embodied in the philosophy of the Bauhaus will form a core component of the course. Towards the end of the course, current theories will be examined, including Marxism and Capitalism, Feminism, and Post-Modernism.

DS 481 Design Studies Senior Research Seminar. *3(3-0-0) . F. Preq: Completion of all course work in DS through junior year ; Design Studies Majors.* Each student in Design Studies will develop a topic for his or her Senior Capstone Research Paper to be done during the Spring term. During the Research semester, each student will develop a comprehensive bibliography for the topic and an outline ofthe paper. One paper will be written before the end of the term that addresses issues directly related to the Capstone Research paper. Throughout the term, students will share their research with others in the seminar.

DS 482 Design Studies Capstone Seminar. *1(1-0-0) . S. Preq: DS 481 ; Design Studies Majors.* Students will meet on a weekly basis to discuss their individual research papers. Drafts of papers will be due at the end of the eighth week of class. Drafts will be read by the instructor, other instructors of the student's choosing, and by two other members of the class for critical analysis.

DS 483 Design Studies Capstone Research Paper. *3(3-0-0) . S. Preq: DS 481 ; Design Studies Majors.* Course consists of guided independent study resulting in a serious research paper. Students will work on their own, with meetings with faculty advisor(s) at weekly intervals.

DS 494 Design Studies Internship. *3-6. F,S,Sum. Preq: Junior or Senior Standing in Design Studies Program ; Design Studies Majors.* Supervised internships in museums, galleries, schools, or other approved venues, in which students are engaged in activities related to Design Studies. Students are responsible for transportation to and from internship.

ENGINEERING

E 101 Introduction to Engineering & Problem Solving. *1(0-2-0) . F. Preq: Engineering Majors, Freshman standing.* An introduction to the College of Engineering as a discipline and profession. Emphasis on engineering design, interdisciplinary teamwork, and problem solving from a general engineering perspective. Overview of academic policies affecting undergraduate engineering students. Exposure to College of Engineering and university-wide programs and services.

E 110 Engineering Scholars Forum. *0(2-0-0) . F,S. Preq: Students in the Engineering Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 111 Engineering Scholars Forum. *0(2-0-0) . F,S. Preq: Students in the Engineering Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 115 Introduction to Computing Environments. *1(0-2-0) . F,S,Sum.* Introduction to the NC State computing system, and to student-owned computing resources. Includes topics such as maintaining your own computer, learning about campus-based computing resources and applications (how to access and use them), ethics andprofessionalism in the use of computing resources, introduction to web development and other campus resources.

E 123 Engineering 1-2-3: Product and Processing Engineering. *2(0-3-0) . F,S.* Introduction to product and process (1) usage, (2) assembly, and (3) engineering calculations and design through the case study approach. Working in teams of two, students explore bar code scanners and inventory systems, compact disc audio and CD-ROM information storage and retrieval, photocopier and FAX devices, optical fiber communications and probes, video camera and video cassette recorder, and water purification technologies.

E 144 Academic and Professional Preparation for Engineering I. *1(1-0-0) . F.* Assist new freshmen engineering students in the transition from high school to the collegiate environment. Cover critical-thinking; problem solving techniques; academic skills and time management.

E 145 Academic and Professional Preparation for Engineering II. *1(1-0-0) . S.* Engineering as a field of study and profession. Career and professional development, goal setting, decision making and effective communication strategies.

E 210 Engineering Scholars Forum. *0(2-0-0) . F,S. Preq: Students in the Engineering Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 211 Engineering Scholars Forum. *0(2-0-0) . F,S. Preq: Students in the Engineering Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

E 432 Patents, Trademarks and Copyrights. *3(3-0-0) . S. Preq: Junior standing.* Patent, trademark and copyright problems that arise in engineering, scientific and industrial pursuits. Includes the rights and remedies available to individual inventors and authors as well as companies. Patent Office procedures and practices.

E 490 Fundamentals of Engineering(FE) Exam Preparation. *1(2-0-0) . F,S. Preq: Engineering Majors, Senior standing and PBS status.* Preparation for graduating seniors in engineering to take the Fundamentals of Engineering (FE) Examination. Information on how to register for the FE exam, exam strategy, and a review of selected science and engineering topics through active learning exercises directed at working sample examination problems. Credit may not be counted toward graduation

E 497 Engineering Research Projects. *1-3. F,S,Sum. Preq: Junior standing in College of Engineering, Engineering Scholars Program or Engineering Research Center Scholars.* Projects in research, design or development in engineering or computer science.

ADULT AND HIGHER EDUCATION

EAC 301 Introduction to Leadership Fundamentals. *3(3-0-0) . F,S. Preq: Sophomore standing, Junior standing, or Senior standing.* This course will provide basic understandings of the components of leadership that can be applied to their current and future leadership experiences on campus or in their individual communities, and to provide a model of critical reflection for those applications.

EAC 496 Special Topics in Adult Learning and Leadership. *1-6. As needed.* Exploration of specialized areas and topics of current interest in adult learning and leadership.

ECONOMICS

EC 201 Principles of Microeconomics. *3(3-0-0) . F,S,Sum.* Scarcity, production possibilities, and opportunity cost. Supply and demand analysis, free markets, the price system, and government policy. Microeconomic analysis of business decisions in competitive and noncompetitive markets. Labor markets, capital, and natural resource markets, and externalities. Market breakdown, income redistribution, and role of government. Free trade, tariffs, and gains from international trade. Credit will not be given for both EC 201 and either ARE 201 or EC 205.

EC 202 Principles of Macroeconomics. *3(3-0-0) . F,S,Sum. Preq: EC 201 or ARE 201.* Aggregate economic analysis emphasizing current public policy issues. Determinants of level and rate of growth of total output. Causes of unemployment and business cycles, inflation, and exchange rate fluctuations. Effects of monetary policy (money supply) and fiscal policy (government spending, taxes, deficits) on these problems. Trade surpluses/deficits and impact of international events and policies on national economies. Credit will not be given for both EC 202 and EC 205.

EC 205 Fundamentals of Economics. *3(3-0-0) . F,S,Sum.* Fundamental ideas in economics: scarcity, substitution, opportunity cost, marginal analysis, gross domestic product, real and nominal magnitudes. Supply and demand

analysis. Microeconomic analysis of pricing in competitive and noncompetitive markets. Macroeconomic analysis of production, employment, the price level, and inflation. Monetary and fiscal policy and the stabilization of the economy. Comparative advantage and international trade. Credit will not be given for both EC 205 and either EC 201 or ARE 201. Credit will not be given for both EC 205 and EC 202.

EC 301 Intermediate Microeconomics. *3(3-0-0) . F,S,Sum. Preq: MA 121 or 131; EC 201 or EC 205 or ARE 201.* Functioning of the market economy, role of prices in determining the allocation of resources, the functioning of the firm in the economy, forces governing the production and consumption of economic goods. Credit not allowed for both EC(ARE) 301 and 401.

EC 302 Intermediate Macroeconomics. *3(3-0-0) . F,S,Sum. Preq: EC 201 or EC 205 or ARE 201; MA 121 or MA 131.* Applied, analytical course in aggregate economics: business cycles, stabilization policy, inflation, costs of disinflation, international trade, and economic growth. Interaction of consumers and businesses with government economic policies; unemployment, interest rates, and output growth. Impacts of government deficits, trade deficits, and monetary policies.

EC 303 Markets and Governments. *3(3-0-0) . F,S,Sum. Preq: EC 201 or EC 205 or ARE 201.* Social benefits of markets and the price system. Market failures and the rationale for government intervention in the economy. Government spending and taxing. Government failures. Applications to policies concerning the environment, labor markets, health care, antitrust, and economic growth.

EC 304 Introduction to Financial Markets and Institutions. *3(3-0-0) . F,S,Sum. Preq: EC 201 or EC 205 or ARE 201.* Financial assets, markets and institutions. Stock and bond markets. Measurement and determination of rates of return on financial assets. Banks and other financial intermediaries including their management and regulation. Roles of the Federal Reserve System and monetary policy in determining interest rates, economic activity and foreign exchange rates. Credit will not be given for both EC 304 and EC 404.

EC 310 Managerial Economics. *3(3-0-0) . Preq: EC 201 or EC 205 or ARE 201.* Microeconomic principles applied to decision-making in the firm. Present value analysis. The relationship between accounting and economic concepts of cost. Criteria and procedures for decision-making under uncertainty. Economic allocation by markets and the price system. Sources of market power and competitive advantage. Applications to product pricing and advertising.

EC (ARE) 336 Introduction to Resource and Environmental Economics. *3(3-0-0) . S. Preq: ARE 201 or EC 201 or EC 205.* Application of basic economic tools to understand and evaluate environmental/resource policies. Concepts such as property rights, non-market goods, allocation over time, externalities, and public goods. Current policy issues such as global climate change, evaluating natural resource damages from oil spills, reducing the costs of regulations, protecting estuaries, and dealing with non-point source pollution.

EC 348 Introduction to International Economics. *3(3-0-0) . F,S,Sum. Preq: EC 201 or EC 205 or ARE 201.* Application of basic economic analysis to international economic events and policies. Gains from trade, impacts of trade restrictions, international systems of payments, global capital markets, and balancing international with domestic macroeconomic policies. Current policy issues such as economic integration (customs unions and free trade areas), a common European currency, and the role of international trade in economic growth and development.

EC (ST) 351 Data Analysis for Economists. *3(3-0-0) . F. Preq: BUSST 350.* Tools for describing and analyzing data as used in economics. Probability, random variables, sampling, point and interval estimation. Hypothesis testing and regression analysis with emphasis on economic applications.

EC 372 Evolution of American Business. *3(3-0-0) . F,S. Preq: EC 201 or EC 205 or ARE 201.* Historical development of modern business enterprise from the Colonial Era through World War II. Emphasis on the transformation of business practices in response to technological change, evolution of capital markets, growth of international trade, changes in distribution techniques, entrepreneurship, and the influence of government regulation.

EC 375 Comparative Economic Systems. *3(3-0-0) . F,S. Preq: EC 201 or EC 205 or ARE 201.* Comparative Economic Systems contrasts market-type economies with other types of economic systems, particularly collectivist or planned economies in order to analyze their relative economic efficiency. The collapse of the Soviet economy will be analyzed as well as the attempts to convert the newly established republics into market economies.

EC 377 The Political Economy of the Market Process. *3(3-0-0) . S. Preq: EC 201 or 205 or ARE 201.* The institutional, philosophical and economic foundations of markets. Social and political implications of private property, voluntarism and the forms of social cooperation derived from markets. The effects of public policies intended to alter the economic outcomes of markets. The morality of markets, legal and institutional settings, cooperation and the nature of exchange, the social function of prices.

EC (ARE) 401 Economic Analysis for Nonmajors. *3(3-0-0) . F,S. Preq: EC 201 or EC 205 or ARE 201.* Intermediate economic theory of firm, household and market behavior. Demand, production and cost theory, market equilibrium under competitive and non-competitive conditions, and problems of economic efficiency. (EC (ARE) 401 is primarily for graduate students desiring an economics minor at the master's level. Students completing intermediate microeconomics and calculus should elect ECG 501, Price Theory, instead.). Not open to undergraduates majoring in the College of Management or Department of Agriculture and Resource Economics. Credit not allowed for both EC(ARE) 301 and EC(ARE) 401.

EC 404 Money, Financial Markets, and the Economy. *3(3-0-0) . F,S. Preq: EC 302, BUSST 350.* Roles of money, credit, and financial institutions in the modern economy. Determination of level and structure of interest rates and exchange rates, determination of security prices. Management and regulation of financial institutions. Federal Reserve System and monetary policy. Statistical analysis of financial and monetary data. Credit will not be given for both EC 304 and EC 404.

EC 410 Public Finance. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* A micro-economic analysis of the rationale for public expenditure and taxation. Externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism.

EC 413 Competition, Monopoly and Public Policy. *3(3-0-0) . S. Preq: EC(ARE) 301.* Current theories of industrial organization with specific reference to such topics as cartels, industrial concentration, vertical integration, franchise contracts, ownership and control of firms, multipart and discriminatory pricing, and tie-in sales. Economic aspects of antitrust law and government regulation of industry.

EC 431 Labor Economics. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* An economic approach to the labor market and its problems including unemployment and the determination of wages, hours and working conditions under various labor market structures. The economic effects of trade unions. Introduction to human capital theory.

EC 435 Urban Economics. *3(3-0-0) . Preq: EC(ARE) 301.* Application of land use and location theory to urban structure and centralized economic activity. Analysis of trends in urbanization and suburbanization. Urban poverty, housing, transportation, pollution and local public finance.

EC (ARE) 436 Environmental Economics. *3(3-0-0) . S. Preq: EC(ARE) 301.* Usefulness of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations, marketable permits and subsidies considered in designing alterations, in the incentive system. Current public policy alternatives in the context of non-market decision-making.

EC 437 Health Economics. *3(3-0-0) . F,S. Preq: EC(ARE) 301 or EC(ARE) 401.* Application of micro-economic tools to the analysis of public and private policy issues concerning health care financing and delivery in the United States.

EC 442 Evolution of Economic Ideas. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* General development of economic ideas from ancient times through the post-Keynesian period. Emphasis on the classical school and developments thereafter. The evolution of economic ideas in the context of the changes in technology and the increasing complexity of economic activity.

EC 448 International Trade. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* Determinants of commodity composition of trade and analysis of tariffs, quotas, and transport costs. Treatment of international investment including multinational corporations. Analysis of the effects of tariffs and quotas. Relationship between international trade and economic growth.

EC 449 International Finance. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* Study of international markets and their effects on firms, investors and national economics. Topics include: futures and options in foreign exchange, management of foreign exchange risk, exchange rate determination, and macroeconomic policy in an open economy.

EC 451 Introduction to Econometrics. *3(3-0-0) . F. Preq: EC(ARE) 301, EC 302, EC 351.* The measurement, specification, estimation and interpretation of functional relationships through single equation least-square techniques. Applications of simple and multiple regression, curvilinear regression and various transformations to demand, cost, production, consumption and investment relationships.

EC 470 The Japanese Economy. *3(3-0-0) . S. Preq: EC(ARE) 301.* Growth and development of the Japanese economy. Issues arising from Japan's integration with the world economy. Analysis of contemporary Japanese economic institutions and business practices. Economics of Japanese government policies.

EC 471 Evolution of the American Economy. *3(3-0-0) . S. Preq: EC(ARE) 301.* Relationship of modern economic development to the history of America. Analysis of contemporary problems and issues with reference to their origins in the historical growth of the economy.

EC 472 The Rise of Industrialism. *3(3-0-0) . F,S. Preq: EC(ARE) 301.* Historical development of the modern industrial economy from origins in medieval and early modern Europe. The industrial revolution in England and its diffusion throughout the western world and beyond.

EC 474 Economics of Financial Institutions and Markets. *3(3-0-0) . S. Preq: MA 121 and [BUS 320 or EC 302].* Management, development and regulation of U.S. financial markets and institutions. Management of major financial intermediaries and their historical development. Analysis of major financial assets and their markets. The role and history of the Federal Reserve and other financial regulators.

EC 480 Introduction to Economic Research. *3(3-0-0) . S. Preq: EC 301, ST/BUS 350, Computer Proficiency.* Finding economic data. Critically analyzing newspaper and journal articles using economic reasoning. Developing, writing, and presenting economic analysis.

EC 490 Research Seminar in Economics. *3(3-0-0) . F,S. Preq: EC(ARE) 301, EC 302, ST(BUS) 350.* The final course for students completing the undergraduate programs in economics. Students study a selected economic issue, make classroom presentations related to the seminar topic, and write research papers.

EC 495 Special Topics in Economics. *1-6. Preq: Departmental approval required.* Examination of special topics in economics not normally treated in other courses, or offering of new courses on a trial basis.

EC 498 Independent Study in Economics. *1-6. F,S,Sum. Preq: Departmental approval required.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Associate Department Head.

COUNSELOR EDUCATION

ECD 101 University Orientation I. *1(1-0-0) . F. Preq: University Transition Program (UTP) students.* An orientation to academic requirements of the various colleges and departments at the University, a review of study skills and time management, advising procedures and decision-making skills, designed to assist students to develop a knowledge of major requirements and requisite comprehension and skills to succeed in college.

ECD 102 University Orientation II. *1(1-0-0) . S. Preq: University Transition Program (UTP) students.* A continuation of ECD 101, the course emphasizes the further development of study skills, time management and methods for the selection of a major field of study.

ECD 220 College Student Development and Peer Counseling. *2(2-0-0) . F,S. Preq: Sophomore standing.* Developmental issues of young adulthood with opportunity for the acquisition of paraprofessional counseling skills and crisis intervention skills. Major consideration is given to self-awareness and values clarification through utilization of personality inventories and self-assessment instruments. Priority will be given to resident advisors and students active in student organizations or volunteer programs.

ECD 221 Career Planning and Personal Development. *3(3-0-0) . F,S.* Knowledge, attitudes, self-understanding, and skills needed to enhance career planning and foster personal development. Study of self-understanding, self-talk, goal setting, the environment, and decision making as ways to adapt more effectively to the challenges of life.

ECD 223 Orientation Counselor Training. *2(2-0-0) . S. Preq: Selection as an Orientation Counselor.* For new student orientation counselors. Relevant research, student development theory, and shared professional experiences are presented. Class discussion, small group activities, simulations, and journal writing employed. Individual projects andan out-of-class team building experience are required. Consent of Department.

ECD 224 Student Development and Peer Mentoring. *2(2-0-0) . F. Preq: Selection as a Peer Mentor, Departmental approval required.* For new student peer mentors of primarily African American freshmen. Relevant student development, psychology and counseling research and theory as well as shared professional experiences are presented. Class discussion, group activities, role playing, relevant readings and video are employed. Reaction papers and project are required.

ECD 296 Special Topics in Education: Counselor Education. *1-3. F,S,Sum.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

ELECTRICAL AND COMPUTER ENGINEERING

ECE 109 Introduction to Computer Systems. *3(3-0-1) . F, S, Sum. Preq: E 115.* Introduction to key concepts in computer systems. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps.

ECE 200 Introduction to Electrical and Computer Engineering Laboratory. *3(1.50-3-0) . F,S. Preq: GPA 2.5 or above, with a C- or better in MA 241 and PY 205 ; EE Majors or CPE Majors. Coreq: PY 208, MA 242.* Laboratory with experiments design to provide fundamental concepts and an overview of electrical and computer engineering specialization areas including Analog and Digital Electronic Circuits, Solid State Electronic Devices, Communication Systems, Signal Processing and Computer Engineering. Experience with standard laboratory equipment including power supply, multimeter, function generator, oscilloscope and spectrum analyzer.

ECE 206 Introduction to Computer Organization. *3(3-0-1) . F,S,Sum. Preq: GPA 2.5 or above, with a C- or better in MA 241, PY 205, and CSC 116.* Introduction to key concepts in computer organization. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps, direct memory access, structured program development.

ECE 209 Computer Systems Programming. *3(3-0-1) . F, S, Sum. Preq: Grade of C- or better ECE 109.* Computer systems programming using the C language. Translation of C into assembly language. Introduction to fundamental data structures: array, list, tree, hash table.

ECE 211 Electric Circuits. *4(3-2-0) . F,S,Sum. Preq: MA 242, PY 208 and a grade of C- or better in ECE 200. Coreq: ECE 220.* Introduction to theory, analysis and design of electric circuits. Voltage, current, power, energy, resistance, capacitance, inductance. Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem, steady state and transient analysis, AC, DC, phasors, operational amplifiers, transfer functions.

ECE 212 Fundamentals of Logic Design. *3(3-0-0) . F,S,Sum. Preq: C- or better in ECE 109 or ECE 206.* Introduction to digital logic design. Boolean algebra, switching functions, Karnaugh maps, modular combinational circuit design, flip-flops, latches, programmable logic, and synchronous sequential circuit design. Use of several CAD tools for logicsynthesis, state assignment, and technology mapping.

ECE 220 Analytical Foundations of Electrical and Computer Engineering. *3(2-0-2) . F,S. Preq: MA 242, CSC 116, PY 208 and C- or better*

in ECE 200. The modeling, analysis and solution of circuit theory, control, communication, computer, and other system arising in electrical and computer engineering using various analytical techniques. Numerical solutions to ECE problems using MATLAB and SPICE.

ECE 292 Special Topics in Electrical and Computer Engineering. *1-3. F,S,Sum.* Special topics in electrical and computer engineering at the early undergraduate level.

ECE 301 Linear Systems. *4(3-3-0) . F,S,Sum. Preq: A grade of C- or better in ECE 211 and ECE 220.* Representation and analysis of linear systems using differential equations: impulse response and convolution, Fourier series, and Fourier and Laplace transformations for discrete time and continuous time signals. Emphasis on interpreting system descriptions in terms of transient and steady-state response. Digital signal processing.

ECE 302 Microelectronics. *4(3-3-0) . F,S. Preq: A grade of C- or better in ECE 211.* Introduction to the physics of semiconductors, PN Junctions, BJT and MOS field Effect Transistors: Physics of operation, IV characteristics, circuit models, SPICE analysis; simple diode circuits; Single Stage Transistor Amplifiers: Common Emitter and Common Source configurations, biasing, calculations of small signal voltage gain, current gain, input resistance and output resistance; Introduction to Differential Amplifiers, Operational Amplifiers.

ECE 303 Electromagnetic Fields. *3(3-0-0) . F,S,Sum. Preq: A grade of C- of bnter in ECE 211 and ECE 220.* Static electric and magnetic fields, Maxwell's equations and force laws. Propagation, reflection and refraction of plane waves. Transient and steady-state behavior of waves on transmission lines.

ECE 305 Electric Power Systems. *3(3-3-0) . F. Preq: A grade of C- or better in ECE 211 and ECE 220.* Principles, performance and characteristics of power-system components, including direct-current and alternating-current machinery, transformer banks and transmission lines. Principles and analysis of system power flow.

ECE 306 Introduction to Embedded Systems. *3(2-2-0) . F,S. Preq: Grade of C- or better in ECE 200, ECE 209, ECE 212 ; CPE majors.* Introduction to designing microcontroller-based embedded computer systems using assembly and C programs to control input/output peripherals. Use of embedded operating system.

ECE 309 Object-Oriented Programming for Electrical and Computer Engineers. *3(3-0-0) . F, S. Preq: Grade of C- or better ECE 209 ; CPE or EE Majors.* Object-oriented design and programming of complex software. Java programming. Data abstraction and data structures. Programming by contract. Software testing. Interacting classes and interface design. Stream input/output, exceptions. Iterators, recursion, analysis of running time.

ECE 331 Principles of Electrical Engineering I. *3(3-0-0) . F,S,Sum. Preq: MA 241, PY 208.* Concepts, units and methods of analysis in electrical engineering. Analysis of d-c and a-c circuits, characteristics of linear and non-linear electrical devices, transformers, motors and control systems. Not available to EE and CPE majors.

ECE 380 Engineering Profession for Electrical Engineers. *1(1-0-0) . F,S. Preq: ECE 212, ECE 301, ECE 302, COM 110 ; EE Majors.* Introduction to engineering as a profession including issues surrounding electrical engineering. Topics include professional and ethical responsibilities, risks and liabilities, intellectual property, and privacy. Economic issues including entrepreneurship and globalization.

ECE 381 Engineering Profession for Computer Engineers. *1(1-0-0) . F, S. Preq: ECE 212, ECE 301, ECE 302, COM 110 ; CPE Majors.* Introduction to engineering as a profession including issues surrounding computer engineering. Topics include professional and ethical responsibilities, risks and liabilities, intellectual property, and privacy. Economic issues including entrepreneurship and globalization.

ECE 402 Communications Engineering. *3(2-3-0) . F,S. Preq: ECE 301, ST 371.* Fundamentals of communications engineering. PCM, digital transmission, PSK, QAM, baseband, FSK, ASK; link budgets for satellite, cellular, and cable systems. Brief coverage of AM, FM, SSB, error correction/detection, modulation, the effects of noise and bandwidth.

ECE 403 Electronics Engineering. *3(2-3-0) . S. Preq: ECE 301, ECE 302.* Design and analysis of discrete and integrated electronic circuits, from single-transistor stages to operational amplifiers, using bipolar and MOS devices. Feedback in operational amplifier circuits, compensation and stability. Laboratory design projects.

ECE 404 Introduction to Solid-State Devices. *3(3-0-0) . F. Preq: ECE 302, ECE 303.* Basic principles required to understand the operation of solid-state devices. Semiconductor device equations developed from fundamental concepts. P-N junction theory developed and applied to the analysis of devices such as varactors, detectors, solar cells, bipolar transistors, field-effect transistors. Emphasis on device physics rather than circuit applications.

ECE 406 Design of Complex Digital Systems. *3(3-3-0) . F,S. Preq: A grade of C- or better in ECE 212.* Design principles for complex digital systems: Iteration, top-down/bottom-up, divide and conquer, and decomposition. Descriptive techniques, including block diagrams, timing diagrams, register transfer, and hardware-description languages. Consideration of transmission-line effects on digital systems.

ECE 407 Introduction to Computer Communications. *3(3-0-0) . S. Preq: ECE 301, ST 371.* Engineering principles of computer communications: summary of digital transmission, media and switching; error control, layering concept, overview of protocols; architectures for local, metropolitan, and wide-area networks; emerging issues in digital communications systems.

ECE 420 Wireless Communication Systems. *3(3-0-0) . F,S. Preq: ECE 402.* System level understanding of wireless mobile communications systems. Mobile radio propagation, system definitions, applicable traffic models, coding, modulation, frequency reuse, cellular concept, equalization; standards such as AMPS, USDC, CDMA(IS-95), GSM.

ECE 421 Introduction to Signal Processing. *3(3-0-0) . F,S. Preq: ECE 301, ST 371.* Concepts of electrical signal processing. Fourier series, Fourier transform, Z-transform, advanced linear systems and stochastic processes. Analog/digital and digital/analog conversion, digital filters and modulation. Major design project.

ECE 422 Transmission Lines and Antennas for Wireless. *3(3-0-0) . F. Preq: ECE 303.* Review of time-varying electromagnetic theory. A study of the analytical techniques and the characteristics of several useful transmission lines and antennas. Examples are coaxial lines, waveguides, microstrip, optical fibers and dipole, monopole and array antennas.

ECE 435 Elements of Control. *3(3-0-0) . F. Preq: ECE 301.* Analog system dynamics, open- and closed-loop control, block diagrams and signal flow graphs, input-output block diagrams and signal flow graphs, input-output relationships, stability analyses using Routh-Hurwitz, root-locus and Nyquist, time- and frequency-domain analysis and design of analog control systems. Use of computer-aided analysis and design tools. Class project.

ECE 436 Digital Control Systems. *3(3-0-0) . S. Preq: ECE 435.* Discrete systems dynamics, sampled-data systems, mathematical representations of analog/digital and digital/analog conversions, open- and closed-loop systems, input-output relationships, state-space and stability analyses, time- and frequency-domainanalyses. Design and implementation of digital controllers.

ECE 437 Distributed Real Time Control Systems. *3(2-4-0) . F,S. Preq: ECE 301 and ECE 306.* Principles for designing an intelligent distributed control system which includes multiple embedded microprocessors communicating over a computer network. Design of basic components, modes, input/output interface, and communication network. Real-time implementation issues, such as sampling, task scheduling, and network traffic control. Lab experiments on design of basic components, plus a major design project.

ECE 442 Integrated Circuit Technology and Fabrication. *3(2-3-0) . F. Preq: ECE 404.* Semiconductor device and integrated-circuit processing and technology. Wafer specification and preparation, oxidation, diffusion, ion implantation, photolithography, design rules and measurement techniques.

ECE 451 Power System Analysis. *3(3-0-0) . F. Preq: ECE 305.* Long-distance transmission of electric power with emphasis on load flow, economic dispatch, fault calculations and system stability. Applications of digital computers to power-system problems. Major design project.

ECE 453 Distribution System Analysis, Design and Operation. *3(3-0-0) . S. Preq: ECE 305.* Electric power distribution systems: load characteristics, short-term load forecasting, capacitive compensation, voltage regulation and control. Distribution transformers. Design of subtransmission and distribution substations, distribution primary systems. Distribution system operations and automation.

ECE 455 Computer Control of Robots. *3(2-3-0) . F,S. Preq: ECE 435.* Techniques of computer control of industrial robots: interfacing with synchronous hardware including analog/digital and digital/analog converters, interfacing noise problems, control of electric and hydraulic actuators, kinematics and kinetics of robots, path control, force control, sensing including vision. Major design project.

ECE 456 Mechatronics. *3(2-3-0) . F,S. Preq: ECE 301.* The study of electro-mechanical systems controlled by microcomputer technology. The theory, design and construction of smart systems; closely coupled and fully integrated products and systems. The synergistic integration of mechanisms, materials, sensors, interfaces, actuators, microcomputers, controllers, and information technology.

ECE (CSC) 460 Digital Systems Interfacing. *3(2-3-0) . F. Preq: Senior standing.* Concepts of microcomputer system architecture and applications to fundamental computer hardware. Theoretical and practical aspects of interfacing and a variety of microprocessor peripheral chips with specific microprocessor/microcomputer systems from both hardware and software points of view.

ECE 463 Advanced Microprocessor Systems Design. *3(3-0-0) . Preq: ECE 406.* Advanced topics in microprocessor systems design, including processor architectures, virtual-memory systems, multiprocessor systems, and single-chip microcomputers. Architectural examples include a variety of processors of current interest, both commercial and experimental. Major design project.

ECE 464 ASIC Design. *3(2-3-0) . S. Preq: ECE 406, ECE 302.* Design of digital application specific integrated circuits (ASICs) based on hardware description languages (Verilog, VHDL) and CAD tools. Emphasis on design practices and underlying algorithms. Introduction to deep sub-micron design issues like interconnections and low power and to modern applications including multi-media, wireless. Telecommunications and computing. Required design project.

ECE 465 Engineering Applications of Artificial Intelligence. *3(3-0-0) . Preq: Senior standing.* Engineering applications of artificial intelligence (AI): Problem-solving techniques, knowledge acquisition, knowledge representation, production systems, expert systems, AI languages, neural networks, and machine learning. Design projects required.

ECE 466 Compiler Optimization and Scheduling. *3(3-0-0) . S. Preq: ECE 306 and CSC 316.* Provide insight into current compiler designs dealing with present and future generations of high performance processors and embedded systems. Investigate dataflow analysis and memory disambiguation, classical and parallelism enhancing optimizations, scheduling and speculative execution, and register allocation. Review of techniques used in current research compilers.

ECE 470 Internetworking. *3(2-3-0) . F,S. Preq: ECE 407 or CSC 401.* Introduction, Planning and Managing networking projects, networking elements-hardware, software, protocols, applications; TCP/IP, ATM, LAN emulation. Design and implementation of networks, measuring and assuring network and application performance;metrics, tools, quality of service. Network-based applications, Network management and security.

ECE 480 Senior Design Project in Electrical Engineering. *3(2-2-4) . F,S. Preq: ECE 303, ECE 380, ENG 331 and any two ECE specialization courses ; EE Majors.* Applications of engineering and basic sciences to the total design of electrical engineering circuits and systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design-team project activity. Complete written and oral engineering report required.

ECE 481 Senior Design Project in Computer Engineering. *3(2-2-4) . F,S. Preq: ECE 381, ECE 303, ECE 406, ENG 331, CSC 316 and an ECE specialization elective ; EE Majors.* Application of engineering and basic sciences to the total design of computer engineering circuits and systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design-team project activity. Complete written and oral engineering report required.

ECE 492 Special Topics in Electrical and Computer Engineering. *1-4. F,S.* Offered as needed for development of new courses in electrical and computer engineering.

ECI 102 Orientation to Middle Grades Education. *0(1-0-0) . F,S. Preq: MSL Majors and unclassified students in MSL.* Orientation and introduction to department, college, and university expectations and procedures. Advisor/advisee interaction and discussion of practical aspects of academic life.

ECI 185 Introduction to Academic Discourse & Learning. *3(3-0-0) . F.* Socializes students to the intellectual conventions of the university by focusing on the learning process and critical thinking with academic discourse, both written and oral.

ECI 201 Intro to Instructional Technology for Educators. *2(2-0-0) . S.* Beginning teachers in North Carolina are required to demonstrate mastery of technology skills, to be able to use that technology in their classrooms and teach the state computer skills curriculum. This hands-on course covers the basic skills included in the National Educational Technology Standards for Teachers. In this course students will begin the process of creating technology artifacts for the teaching portfolio, required for initial licensure.

ECI 205 Introduction to Teaching Humanities and social Sciences. *3(2-3-0) . F,S. Preq: Sophomore standing.* For prospective teachers in secondary and middle years social studies, English, language arts, and foreign languages. An emphasis on differing aspects and procedures of instruction and analysis of competencies required of teachers. Field work in avariety of education settings including an extended period in one curriculum area.

ECI 210 Introduction to Collge Tutoring. *1(1-0-0) . F,S. Preq: GPA 3.0 or higher and who plan to become university tutors..* Development of basic tutoring skills. Areas of emphasis include recognizing and responding to various learning difficulties, implementing a variety of tutoring methods, and developing the ability to self-critique tutoring performance.

ECI 211 Advanced Tutoring Concepts. *1(1-0-0) . F,S. Preq: ECI 210.* Advanced tutoring techniques for experienced tutors. Emphasis on student developmental level and learning styles. Development of skills in responding to learning difficulties and self-critique of tutoring performance. Registration is restricted touniversity tutors.

ECI 296 Special Topics in Education. *1-3. F,S,Sum.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ECI (GEO) 300 World Regional Geography. *3(3-0-0) . Preq: GEO 200.* Geography of selected industrial and Third World regions in which the evolution of settlement, culture, economy and political forms are treated in geographical perspective.

ECI 303 Planning for Student Vocational Organizations. *3(3-0-0) .*

ECI 305 Principles of Teaching Diverse Populations. *3(3-0-0) . F,Sum. Preq: ECI 205 or EMS 203.* Impact of cultural factors on experiences of teachers and students in contemporary schools. Teaching techniques and development of instructional plans to enhance schooling experiences of culturally diverse students.

ECI 306 Middle Years Reading. *3(3-0-0) . S. Preq: 6 hours EDPSY.* Reading skills in middle years education developed with emphasis on application of the reading process to content area.

ECI 307 Teaching Writing Across the Curriculum. *3(3-0-0) . S. Preq: ENG 112.* For prospective teachers of all disciplines in middle/high school. Practical strategies for writing as a learning tool and for teaching writing. Lesson plans, assignments, experiences appropriate to content areas. Focus on writing, writing instruction, and technology. Separate sections for Middle Grades (MSL) and English (LTN) majors.

ECI 309 Teaching in the Middle Years. *3(3-0-0) . F,S. Preq: 6 hours EDPSY.* Nature and purposes of middle grades education. Early adolescent development, curriculum, teaching/learning methods, school organization, and characteristics of effective middle years teachers. Includes field experience.

ECI 331 Health Professions. *3(3-0-0) . Sum, Alt. yrs.* An examination of key occupations and professions in the health cluster. Emphasis is on educational preparation, requirements for practice, potential advancement, inter- and intra-professional relationships, ethical foundations of practice, and the concept of commitment. Theoretical concept of role structure and function.

ECI 332 Health Promotion and Disease Prevention. *3(3-0-0) . S, Alt. yrs. Preq: For credentialed health professionals only.* Emphasis on education of the public regarding general health concerns including cancer, cardiovascular

disease, accident prevention, nutrition, drugs, alcohol, mental health, sexuality, and environmental hazards.

ECI 333 Health Care Delivery. *3(3-0-0) .* The historical basis of healthy care delivery in the U. S. with emphasis on hospitals, health maintenance organizations, ambulatory care centers, ambulatory surgery, nursing homes, and private care practice. Philosophical issues of funding health care, promoting health care, and the training of healthy care workers.

ECI 335 Planning Classroom and Clinical Curricula. *3(3-0-0) . Prerq: For Certification Majors: EOE 101, 205 ; For Non-Certification Majors: EOE 101. For credentialed health professionals.* Procedures for planning health occupations curricula for classroom and clinical settings. Practice in writing, updating, and refining health curriculum with emphasis on selection and sequencing. Comparison of styles of writing curricula. Roles and responsibilities of healthy curriculum planner.

ECI 336 Strategies for Teaching a Health Occupations Course. *3(3-0-0) . S. Preq: For credentialed health professionals.* Planning and implementation of effective instructional strategies for clinical and classroom settings. The nature of the teaching/learning process, psychological and philosophical aspects of teacher choice of various strategies.

ECI (ENG) 405 Literature for Adolescents. *3(3-0-0) . F. Preq: Junior standing or above.* Reviews the history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum.

ECI 414 Human Relations and Discipline in the Classroom. *3(3-0-0) . Alt yrs. Preq: PSY 304 or EDP 304 and 6 hours of education.* Designed to help prospective teachers foster positive interpersonal relationships in classrooms, build a sense of community and create a purposive environment for learning. Investigates issues such as group building, active listening, and major approaches to discipline. Uses case studies and problem solving methods.

ECI 415 The Arts and Adolescence. *2(2-0-0) . S. Preq: 6 hours ED/PSY; Middle Grades Majors (MSL, MSD).* Relationship of the arts to the academic work of adolescent learners. Arts and adolescent development; arts and learning processes within and outside of the classroom; experimentation and skill development in graphic arts, sculpture, music, drama, dance/movement, film, and poetry.

ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom. *3(3-0-0) . S. Preq: Six hours ED/PSY.* Provides classroom teachers in all disciplines and grade levels with a knowledge of various handicapping conditions, as well as with techniques to assist exceptional students within the mainstreamed classroom. Required for MSL majors.

ECI 423 Methods and Materials in Teaching Modern Foreign Languages. *5(4-2-0) . F. Preq: Admission to Professional Semester. Coreq: ECI 424.* Methods and materials for teaching modern foreign languages K-12 including the use of instructional media. Taught M-F during first 7 weeks of the semester.

ECI 424 Student Teaching in French or Spanish. *8(2-15-0) . F. Preq: Admission to Professional semester. Coreq: ECI 423.* Ten-week teaching experience for prospective teachers of French or Spanish in a selected elementary, middle or high school under the supervision of a cooperating teacher and a university faculty supervisor.

ECI (FL) 425 Methods and Materials in Teaching English as a Second Language. *3(3-0-0) . S. Preq: Admission to Teacher Education Candidacy or admission to ESL Licensure Program.* Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools.

ECI 430 Methods and Materials for Teaching Language Arts in the Middle Grades. *4(3-2-0) . F. Preq: ECI 205,ELP 344,PSY 304 or EDP 304,ECI 309, ECI 306, ECI 307, Senior standing, candidacy in Middle Grades Teacher Education. Coreq: ECI 435.* Inquiry, activity-oriented course provides opportunities for prospective language arts middle school teachers to integrate knowledge of English with effective materials, strategies, methods of instruction. Students observe middle school classes, plan lessons, and units, practice varied classroom strategies, technologies in micro-lessons. Prepared students for teaching language arts with other content areas in middle schools.

ECI 434 Clinical Supervision in Health Occupations. *3(3-0-0) . S, Alt. yrs. Preq: Six hours of Health Occupations courses.* Supervisory techniques for health care professionals in initial levels of administrative positions. Internal and external factors affecting and staffing and supervision process. Organization of the supervisory process. Government and labor relations in the health industry.

ECI 435 Methods and Materials for Teaching Social Studies in the Middle Grades. *4(3-2-0) . F. Preq: Admission to professional semester.* For preservice middle school social studies teachers. Focus on: teaching and evaluation skills, adaptation of instruction to individual learner differences, identification and creation of instructional materials appropriate for use in social studies teaching.

ECI 436 Evaluative Skills in Teaching Health Occupations. *3(3-0-0) .* Program and process evaluation in health care curriculum, instruction, learning and clinical performance. Analysis of existing instruments/designs for clinical evaluation with respect to validity and reliability. Development of instruments to evaluate clinical performance, construction of test items, and health care program effectiveness.

ECI 437 Health Occupations Teaching Practicum. *3-8, F,S.* Practical teaching experience in health occupations. Certification majors complete 15 weeks of student teaching in secondary programs (8 credit hours). Non-certification majors teach in a hospital, community college, technical institute, private health industry, or other health-care setting (3-8 credit hours.)

ECI 438 Medical Law and Ethics. *3(3-0-0) . F.* Ethical and legal issues involved in delivering health care, such as euthanasia, reproductive technology, organ transplants, patients' rights, and confidentiality. Classical ethical theories and principles. Systematic review procedures and currentmedical law used to examine current case dilemmas in the health professions.

ECI (FL) 440 Internship in Teaching English as a Second Language. *1-3. Sum. Preq: Admission to ESL Licensure Program. Coreq: Teacher Licensure in any primary area.* Skills and techniques required in teaching ESL in a public school setting. 15 hours of classroom observation and 30 hours in direct instruction. Demonstration of competencies essential for teaching ESL.

ECI 444 Administration of Business and Marketing Education. *3(3-0-0) . F. Preq: Admission to Teacher Education Candidacy ; MKE Business and Marketing Education Majors. Coreq: ECI 446.* Development of successful business and information technology, and marketing education programs. Program promotion, managing cooperative education experiences, managing DECA and FBLA chapters, and determining professional development strategies. Primary roles of the business and information technology and marketing education teachers' classroom instruction. Program management, classroom management, management of career-technical student organizations, cooperative education, and program development.

ECI 446 Curriculum and Methods of Teaching Business and Marketing Education. *3(3-0-0) . F. Preq: Admission to Teacher Education Candidacy ; MKE Business and Marketing Education Majors. Coreq: ECI 444.* Study of the curriculum common to business and information technology and marketing education and the research behind its development. Methods common to instructional planning, implementation, and evaluation of effective business and information technology and marketing education programs.

ECI 447 Student Teaching in Business and Marketing Education. *8(2-15-0) . S. Preq: Admission to Professional Semester ; MKE Business and Marketing Education Majors. Coreq: ECI 494.* Fifteen weeks full time student teaching business and marketing subjects in the public schools under the supervision of a cooperating teacher and university supervisor. Instruction, evaluation, advisement, administration, observation. Students are expected to provide their own transportation to and from assigned public schools.

ECI 450 Methods and Materials in Teaching English. *4(3-2-0) . F. Preq: ECI 205, ELP 344, PSY 304 or EDP 304; Senior standing and admission to Teacher Education candidacy with a Major in English.* Methods and materials of teaching English in grades 9-12, with an emphasis on lesson planning and demonstrations/practice in teaching literature, study skills, speaking, listening, and writing. Taught during the first seven weeks of the semester.

ECI 451 Improving Reading in Secondary Schools. *2(2-0-0) . F,S,Sum. Preq: 6 hours of ED and/or PST.* A study of methods and materials for teaching

reading in the secondary school, with an emphasis on the effective use of written materials for content area instruction.

ECI 458 Student Teaching in English/Language Arts. *1-8. S. Preq: Admission to Student Teaching Professional Semester ; For MSL students: ECI 430; 416, 464. For LTN students: ECI 450.* Provides the prospective teacher with experience in the techniques and skills involved in teaching English or Language Arts. Ten weeks in a selected off-campus station. Student teachers become familiar with the total school program and participate in selected school and community activities.

ECI 460 Methods and Materials in Teaching Secondary Social Studies. *4(3-1-0) . F. Preq: ECI 205, ELP 344, Sr. standing and admission to professional semester with a major in either history, sociology, political science.* Teaching techniques, innovations, and development of teaching and evaluation skills in the area of secondary school social studies. Adaptation of instruction to individual learner differences, and selection and design of instructional materials. Taught during the first six weeks of the semester. Taught during the first six weeks of the semester.

ECI 464 Student Teaching in Social Studies. *3-8. F. Preq: Admission to professional semester. Coreq: For LTH, LTP, LTS students: ECI 460. For MSL students: ECI 454, 430, 416.* Skills and techniques in teaching social studies in secondary and middle schools. Each student spends ten weeks in a selected off-campus center. The student demonstrates competencies essential for teaching social studies, becomes familiar with thetotal school program, and participates in a variety of school and community activities.

ECI 471 Educational Implications of Learning and Developmental Theory. *3(3-0-0) . Sum. Preq: NC TEACH Participants.* Topics related to human psychological development. Cognitive, social, physical changes, and their interaction among adolescence. Departmental Approval Required.

ECI 472 Interaction of Classroom Management and Instruction. *3(3-0-0) . Sum. Preq: ECI 471 ; NC TEACH Participants.* Topics related to teaching in the content area and classroom management. Lesson planning, principles applied to education, measurement and evaluation procedures, behavior therapy, and student motivation. Departmental Approval Required.

ECI 473 Subject Specific Methods. *3(3-0-0) . F. Preq: ECI 472 ; NC TEACH Participants. Coreq: ECI 474.* Topics related to cultural factors and how they affect teachers and students in the classroom. Instructional techniques and the development of instructional plans that enhance schooling experiences of culturally diverse students. Departmental Approval Required.

ECI 474 Curriculum and Instruction Practices 1. *3(3-0-0) . F. Preq: ECI 472 ; NC TEACH participans. Coreq: ECI 473.* Topics related to essential skills and concepts needed by beginning teachers. The class focuses on questioning, test preparation, discussion skills, familiarity with national standards, multiple teaching strategies, and assessment + evaluation of students. Departmental Approval Required.

ECI 475 Peer Mentoring in Alternative Licensure. *3(3-0-0) . S. Preq: ECI 474 ; NC TEACH Participants. Coreq: ECI 476.* Topics related to observing and evaluating fellow teachers in relation to the national state teaching competencies. Classroom observations, videotaping, and group evaluations that are shared and discussed with fellow teachers. Departmental Approval Required.

ECI 476 Curriculum and Instruction Practices 2. *3(3-0-0) . S. Preq: ECE 474 ; NC TEACH Participants. Coreq: ECI 475.* Topics related to inquiry, activity based instruction, and constructivist principles. Analysis of principles, strategies and application of new teaching approaches. Departmental Approval Required.

ECI 483 An Introduction to Media and Instructional Technology. *3(3-0-0) . F,S,Sum. Preq: Junior standing.* Survey of instructional media and instructional technology. Relationship between media and instructional objectives. Computer based projects in designing and developing instructional materials using software.

ECI 488 Basic American Sign Language. *3(3-0-0) . F,S. Preq: Restricted elective for Communications Majors.* Conversational sign language skill development and introduction to aspects of American Sign language, deafness, and deaf culture.

ECI 494 Senior Seminar in Business and Marketing Education. *3(3-0-0) . S. Preq: Admission to Professional Semester ; MKE Business and Marketing Education Majors. Coreq: ECI 447.* Discussion and analysis of problems, trends, and issues experienced while student teaching in the public schools.

ECI 496 Special Topics in Education. *1-3. F,S,Sum. Prvq: Junior standing or Senior standing.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

EDUCATION

ED 101 Freshman Teaching Fellows Forum I. *1(1-0-0) . F.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.Restricted to Students Admitted to the Teaching Fellows Program

ED 102 Freshman Teaching Fellows Forum II. *1(1-0-0) . S.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.Restricted to Students Admitted to the Teaching Fellows Program

ED 103 Teaching Fellows Seminar. *1(0-2-0) . F.* An orientation to academic requirements of higher education, a review of teacher education components and elements of teacher education curricula, identification of characteristics of an effective student, and an introduction to instructional methods and issues in the field of education.

ED 111 Education and Psychology Scholars Forum. *0(2-0-0) . F,S. Preq: Education and Psychology Scholars Program.* Interdisciplinary seminar with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

ED 150 Students Advocating for Youth I. *1(1-0-0) . F.* Building upon a passion for advocacy. Investigating issues related to youth in today's North Carolina. Exploring youth advocacy and ethics. Exploring youth advocacy and diversity. Exploring youth advocacy as a vocation. Practical youth advocacy field work. Participation in field experiences required. Restricted to students admitted to the SAY program.

ED 151 Students Advocating for Youth II. *1(1-0-0) . S. Preq: ED 150.* Continuing to build upon a passion for advocacy. Understanding how legislation and policy affects youth advocacy and youth organizations. Exploring changes within the career field. Exploring peer influence processes among youth. Practical youthadvocacy field work. Participation in field experiences required. Field experience may extend beyond normal class time. Restricted to students admitted to the SAY program.

ED 201 Sophomore Teaching Fellows Forum I. *1(1-0-0) . F. Preq: Students in Teaching Fellows Program.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.

ED 202 Sophomore Teaching Fellows Forum II. *1(1-0-0) . S.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.Restricted to Students Admitted to the Teaching Fellows Program

ED (AEE) 206 Introduction to Teaching Agriculture. *3(2-3-0) . F.* Introduction to teaching agricultural education in middle and secondary schools and collaborative efforts for teaching agricultural education to adults as rural community situations dictate. Field experiences include three hours per week of structured observations of classroom teachers, teacher assistant activities, and reflections of the experience.

ED 211 Education and Psychology Scholars Forum. *0(2-0-0) . F,S. Preq: Participants in the Education and Psychology Scholars Program.* Second level of interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

ED (AEE, EOE) 226 Computer Applications and Information Technology in Agricultural & Extension Ed. *3(1-4-0) . F,S.* Use of computers and commercially produced agricultural software; the computer as a management tool; agricultural occupational applications of the computer; a multimedia instructional tool in agricultural classrooms and training situations;

use of technology for processing information and imaging; network access; and electronic communications.

ED 296 Special Topics in Education. *1-3. F,S.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ED 301 Junior Teaching Fellows Forum I. *1(1-0-0) . F.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.Restricted to Students Admitted to the Teaching Fellows Program

ED 302 Junior Teaching Fellows Forum II. *1(1-0-0) . S.* Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.Restricted to Students Admitted to the Teaching Fellows Program

ED (AEE) 303 Administration and Supervision of Student Organizations. *3(2-2-0) . S. Preq: AEE 206 or EOE 207.* Principles and techniques for organizing, administering and supervising student organization activities.

ED 310 Tutoring Adolescents. *1(1-2-0) . F,S. Preq: ECI 205 or EOE 207. Coreq: EMS 203.* Developing skills in tutoring adolescent students. Emphases include identifying adolescent learning difficulties, using a variety of tutoring methods and a tutorial self-evaluation process. Requires off-campus field work.

ED (AEE) 322 Experiential Learning in Agriculture. *2(2-0-0) . F.* Planning, organizing, implementing, supervising and evaluating Supervised Agricultural Experience (SAE) programs in agriculture.

ED (AEE) 327 Conducting Summer Programs in Agricultural Education. *1(0-3-0) . F. Preq: AEE/EED206; AEE(EED)322; and AEE 323.* Field experience emphasizing summer agricultural education programs. Individualized instruction for students during supervised agricultural experience visits and youth organization activities. Professional development and program improvement activities.

ED 403 Teaching Fellows Senior Seminar. *1(1-0-0) . F,S. Preq: Senior standing.* A casebook study of first-year teacher experiences and an examination of professional, ethical, and legal issues in education as found in cases dealing with new teachers.

ED (AEE) 424 Planning Agricultural Educational Programs. *3(3-0-0) . S. Preq: AEE(ED) 426. Coreq: AEE(ED) 427.* Principles of program planning applied to educational programs in agriculture; includes theory and field experiences in planning, organizing, and evaluating high school and adult education programs.

ED (AEE, EOE) 426 Methods of Teaching Agriculture. *3(3-0-0) . F. Preq: Junior standing.* Discussion and practice in planning and presenting instruction in agriculture in formal and informal settings. Principles and application of approaches to teaching and organizing instruction, motivating students, developing instructional objectives, selecting and using teaching techniques, evaluating instruction, and managing classroom and laboratory instruction.

ED (AEE, EOE) 427 Student Teaching in Agriculture. *8(2-15-0) . Preq: AEE (ED) 426; Admission to Professional Semester. Coreq: AEE (ED) 490, AEE (ED) 424.* Skills and techniques in teaching agriculture in a public school setting. Secondary agricultural education program teaching experience under the supervision of university faculty and an experienced agriculture teacher.

ED 490 Seminar in Agricultural and Extension Education. *1(1-0-0) . S. Preq: Admission to Professional Semester.* Analysis of opportunities and challenges facing educational leaders in agriculture.

ED 496 Special Topics in Education. *1-3. F,S. Preq: Junior standing or Senior standing.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

EDUCATIONAL PSYCHOLOGY

EDP 304 Educational Psychology. *3(3-0-0) . F,S,Sum. Preq: Sophomore standing.* Psychological principles applied to education, including cognitive and personality development, individual differences, learning and behavior theory, cognitive strategies for learning and remembering, critical thinking and problem-solving strategies, student motivation, classroom management techniques, components of teacher effectiveness, measurement and student evaluation procedures, characteristics of exceptional children, mainstreaming the classroom, and multicultural education.

EDP 370 Applied Child Development. *3(3-0-0) . F. Preq: Sophomore standing.* Students will explore how biological, cognitive, and social/emotional development affects children's learning and behavior. The course will focus on applying important theories and current findings in development to issues in education such as lesson planning, curriculum design, behavior management, motivation, an appropriate assessment. Students will also apply knowledge of development to issues such as creating actively engaging individuated experiences to deal with gifted students, students with diverse ethnic or cultural backgrounds, and students with exceptionalities or disabilities.

EDP (PSY) 476 Psychology of Adolescent Development. *3(3-0-0) . F,S,Sum. Preq: PSY 200 or EDP 304.* Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.

MECHATRONICS

EGM 180 Introduction to Mechatronics Laboratory. *2(1-3-0) . S.* The objective of this course is to introduce students to the mechatronic engineering discipline as a synergistic combination of mechanical and electrical engineering, computer science, control and information technology. Foundational concepts in mechatronics are addressed including analog and digital electonics, sensors, actuators, microprocessors, and microprocessor interfacing to electromechanical systems through hands on laboratory exercises.Offered only at UNCA

EGM 360 Advanced Mechatronics Design Laboratory. *1(0-3-0) . F. Preq: EGM 180.* An introduction to the design and construction of microprocessor-controlled electromechanical systems, this laboratory course builds on fundamental mechatronics concepts. The course is project and design oriented to provide hands on working knowledge of real time software, real time programming, computer interfacing, mechanical design fabrication and control system design and the integration of these areas.For EGM students only; offered only at UNCA

ELEMENTARY EDUCATION

ELM 250 Introduction to Elementary Education in a Global Society. *3(3-0-0) . S. Preq: Sophomore standing.* Introduction to the major conceptual and intellectual foundations of the teaching profession, the sociology and culture of elementary schools and classrooms, and the world of work of elementary teachers. Fieldwork in schools and related settings maybe required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.Students interested in Elementary Education.

ELM 310 Children's Thinking and Additive Reasoning. *3(3-0-0) . F. Preq: ELM 250, Junior standing, Elementary Education Majors.* Examination of mathematical reasoning processes in primary grade children and the theory and practice of active teaching strategies designed to motivate and engage children in mathematics learning in grades K-3. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 320 Teaching Science in the Primary Grades. *3(3-0-0) . F. Preq: ELM 250, Junior standing, Elementary Education Majors.* Examination of science knowledge and thinking in primary-age children. Development and application of methods for teaching science in the primary grades that leads to active learning of science as a process of inquiry. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 330 Twenty First Century Literacy. *3(3-0-0) . F. Preq: ELM 250, Junior standing, Elementary Education Majors.* Examination and development

of methodologies that relate to the theory and practice of teaching literature and information media for children in the 21st century. Prepares preservice teachers to teach literature and media in the elementary grades. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 335 Teaching Reading in the Elementary School. *3(3-0-0) . S. Preq: ELM 330, Junior standing, Elementary Education Majors.* Theories and best practices for teaching reading in the elementary grades. Specific methodologies that enhance capacities of struggling readers, assist with comprehension of content-area reading, and support and extend independent reading abilities for children in elementary grades. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 340 Children Design, Create and Invent. *3(3-0-0) . S. Preq: ELM 370, Junior standing, Elementary Education Majors.* An active hands-on class where prospective elementary school teachers develop learning activities that children can use to stimulate their imaginations and learn fundamental concepts in science, technology, engineering, and mathematics. Part of a program leading to licensure in Elementary Education.

ELM 350 Assessment of Learning and Behavior. *3(3-0-0) . F. Preq: ELM 250, Junior standing, Elementary Education Majors.* Application of knowledge of pedagogy and development to develop high-quality strategies for formative and summative assessment. Best practices using developmentally-appropriate assessment strategies including authentic assessment, portfolios and electronic portfolios, real-time feedback, open- and closed-ended formal assessments, and standardized testing. Particular attention to examining the rationale for assessment and the implications of assessment.

ELM 370 Connections Seminar I The Elementary Classroom and School Community. *3(2-0-3) . F. Preq: ELM 250, Junior standing, Elementary Education Majors.* First of four seminars required for undergraduate elementary education majors. This course introduces preservice teachers to the world of public school classrooms, the tasks of teaching, and to their perspectives regarding a career in teaching. Examines relationships between theory and practice of teaching in mathematics, science, literacy, and assessment. Weekly fieldwork in schools and related settings is required 3 hours a week. Students are responsible for transportation to and from their school based experiences.

ELM 375 Connections Seminar II Cultural Identity, Social Justice and Diverse Learners. *3(2-0-3) . S. Preq: ELM 370/Junior standing, Elementary Education majors..* This seminar is the second of four seminars required for undergraduate elementary education majors who are pursuing K-6 teacher licensure. The purpose of the course is to help prospective elementary grades teachers develop competencies for increasing student achievement by focusing on multicultural education, teaching to diversity, and understanding the classroom culture. Weekly fieldwork in schools and related settings is required 3 hours a week. Students are responsible for transportation to and from their school based experiences.

ELM 400 Connections Seminar III Instructional Design and Assessment. *3(2-0-3) . F. Preq: ELM 375, Senior standing, Elementary Education Majors.* This seminar is the third of four semesters required for undergraduate elementary education majors who are pursuing K-6 teacher licensure. Preservice elementary educators will examine research-verified practices in instructional design and assessment that are designed to meet the needs of diverse K-6 learners. Candidates will complete a capstone project that will be taught during their student teaching experience. Weekly fieldwork in schools and related settings is required. Students are responsible for transportation to and from their school based experiences.

ELM 410 Children's Thinking and Multiplicative Reasoning. *3(3-0-0) . S. Preq: ELM 310, Junior standing, Elementary Education Majors.* This course is designed to prepare preservice teachers to teach math in the intermediate grades and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching of math will be examined. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 420 Teaching Science in the Intermediate Grades. *3(3-0-0) . F. Preq: ELM 320, Senior standing, Elementary Education Majors.* This course is designed to prepare preservice teachers to teach science in intermediate grades and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching science will be examined. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 430 Teaching Language Arts in the Elementary School. *3(3-0-0) . F. Preq: ELM 335, Senior standing, Elementary Education Majors.* This course is designed to prepare preservice teachers to teach language arts and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching language arts will be examined. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 440 Teaching Children with Special Needs in the Elementary Classroom. *3(3-0-0) . F. Preq: ELM 350, ELM 375, Senior standing, Elementary Education Majors. Coreq: ELM 420.* This course is designed to prepare preservice teachers to teach students with special needs and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching students with special needs willbe examined. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 450 The Arts for Elementary Education. *3(3-0-0) . F. Preq: ELM 375, Senior standing, Elementary Education Majors.* This course is designed to prepare preservice teachers to integrate the arts; visual music, dance and drama. into the content areas. Successful completion of this course leads to licensure in the elementary grades. Specific methodologies that relateto the theory and practice of teaching the arts will be examined.

ELM 460 Social Studies for the Young Learner. *3(3-0-0) . S. Preq: ELM 370, Junior standing, Elementary Education Majors.* This course is designed to prepare preservice teachers to teach social studies and to lead to licensure in the elementary grades. The course is an examination of curriculum, instruction, and learning in K-6 social studies education. Emphases includedevelopment of the social studies; curricular principles and components; teaching strategies; and learner outcomes. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportationto and from their school based experiences.

ELM 480 Connections Seminar IV Linking Theory and Practice. *3(3-0-0) . S. Preq: ELM 400, Elementary Education Majors, Admission to the Professional Semester. Coreq: ELM 484.* ELM 480 Connections Seminar IV is designed as the Capstone Course in the Elementary Education Program. Preservice teachers will meet weekly to reflect on the student teaching experience and connect new learning to previous university coursework. In addition, preservice teachers will complete their Integrated INTASC and technology portfolios. Successful completion of student teaching and portfolio requirements will lead to licensure in the elementary grades; K-6.

ELM 484 Student Teaching in Elementary Education. *8(0-0-30) . S. Preq: ELM 400, Elementary Education Majors, Admission to the Professional Semester.* Culminating experience for Elementary Education majors. A minimum of 10 weeks of supervised teaching in an elementary school classroom, demonstrating competent applications of standards-based practices and other required knowledge, skill, and dispositional outcomes. Taken concurrently with ELM 480. Students responsible for transportation to placement site.

EDUCATIONAL LEADERSHIP AND POLICY STUDIES

ELP 296 Special Topics in Education: General Studies. *1-3. F,S,Sum.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ELP 344 School and Society. *3(3-0-0) . F,S,Sum. Preq: Junior standing.* The interrelationship between the school and other institutions, values, and patterns of thought in American society.

ELP 496 Special Topics in Education: General Studies. *1-3. F,S,Sum. Preq: Junior standing or Senior standing, Consent of Instructor.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

EMS 101 Orientation to Mathematics and Science Education. *0(1-0-0) . F,S.* Overview of departmental expectations and procedures and introduction to practical aspects of academic life. Opportunity for interaction of students with advisors and with other undergraduates who are nearing completion of programs.Open only to students in Math and Science Education

EMS 203 Introduction to Teaching Mathematics and Science. *3(2-3-0) . F,S.* Introduces prospective teachers to the teaching of mathematics and science in the middle school and high school. As an important part of the course, students serve as teacher assistants to a classroom teacher. Ideas and questions arising from this experience provide an integral part of the classroom instruction on campus.

EMS 296 Special Topics in Education. *1-3.* Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

EMS 373 Instructional Materials in Science. *3(2-2-0) . F. Preq: EMS 203, ELP 344, PSY 304 or EDP 304. Coreq: EMS 475.* Development and selection of teaching materials that reflect concepts of content and emphasis in middle and secondary school science. Experimental and laboratory approaches, including use of microcomputer and video technologies.2 lecture hours and 6 lab hours per week for 7 weeks

EMS 375 Methods of Teaching Science 1. *3(2-2-0) . S. Preq: EMS 377. Coreq: EMS 203.* Classroom, laboratory, and internship experiences for pre-service teachers to effectively prepare, plan and assess learning environments in the middle and secondary science classroom and instructional laboratory. Emphasis placed on knowledge, skills, and dispositions for inquire-based learning environments.

EMS 470 Methods and Materials for Teaching Mathematics. *3(3-0-0) . F. Preq: Admission to professional semester.* Purposes, methods, curricula and evaluation practices for teaching mathematics in middle school and high school.Taught during the first seven weeks of the semester

EMS 471 Student Teaching in Mathematics. *3-8. F. Preq: Admision to professional semester. Coreq: EMS 470.* Supervised experience in a selected middle or secondary school for 10 weeks, to develop and practice the skills and techniques for teaching mathematics.

EMS 472 Teaching Mathematics Topics in Senior High School. *3(3-0-0) . F. Preq: Admission to professional semester. Coreq: EMS 470.* Preparation for teaching mathematics from both the college preparatory (algebra, geometry, trigonometry, advanced mathematics) and general courses (pre-algebra, technical and consumer mathematics) offered in grades 9-12.Taught during the first sevenweeks of the semester.

EMS 474 Teaching Mathematics Topics in the Middle Grades. *3(3-0-0) . F. Preq: Admission to professional semester. Coreq: EMS 470.* Methods of teaching arithmetic, geometry, and pre-algebra topics in grades 6-9. Emphasizes approaches that actively involve learners and relate operations on concrete and pictorial representations to mathematical symbols.Taught during the first 7 weeks of the semester.

EMS 475 Methods of Teaching Science II. *3(3-0-0) . F. Preq: EMS 203, ELP 344, ED 310, PSY 304 or EDP 304. Coreq: EMS 476.* Goals, methods, curricula, and evaluation practices in teaching the physical and biological sciences at the middle and secondary school levels.Taught during the first seven weeks of the semester

EMS 476 Student Teaching in Science. *4-8. F. Preq: EMS 203, ELP 344, ED 310, PSY 304 or EDP 304, Senior standing and admitted to the professional semester. Coreq: EMS 475.* Supervised classroom experience in developing the skills and techniques for teaching science in a seleeted middle or secondary school for 10 weeks.

EMS 480 Teaching Mathematics with Technology. *3(3-0-0) . F,S. Preq: EMS 203; MA 131 or 141.* Prepares prospective mathematics teachers to use technology in their classrooms to assist students in formulating and solving math problems in the middle and high school mathematics curricula.

EMS 495 Senior Seminar in Mathematics and Science Education. *1-3. Preq: Advanced Undergraduate standing and Department approval required.* In-depth investigation of one or more teaching areas in mathematics or science education.

EMS 496 Special Topics in Education. *1-3. Preq: Junior or senior standing and consent of instructor.* Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

ENGLISH

ENG 100 Introduction to Academic Writing. *4(4-0-0) . F,S,Sum.* Intensive introduction to critical writing and reading in academic contexts. Exploration of writing processes and academic literacy skills: interpreting assignments; comprehending, analyzing, and evaluating college-level texts; inventing, drafting,and revising; seeking, providing, and responding to constructive feedback; collaborating effectively under varied learning models. Extensive writing practice and individualized coaching. Attention to grammar and conventions of standard written English. Intended as preparation for ENG 101. Successful completion of ENG 100 requires a grade of C- or better. Credit for ENG 100 is not allowed if student has prior credit for ENG 101.

ENG 101 Academic Writing and Research. *4(4-0-0) . F,S,Sum. Preq: Grade of C- or better in ENG 100 or placement via English Department guidelines.* Intensive instruction in academic writing and research. Basic principles of rhetoric and strategies for academic inquiry and argument. Instruction and practice in critical reading, including the generative and responsible use of print and electronic sources for academic research. Exploration of literate practices across a range of academic domains, laying the foundation for further writing development in college. Continued attention to grammar and conventions of standard written English. Successful completion of ENG 101 requires a grade of C- or better.

ENG 201 Writing Literary Analysis. *3(3-0-0) . F,S,Sum.* Writing about literature for a variety of audiences. Strategies for writing close textual analysis - including attention to versification, narrative technique, and dramatic structure - and for articulating biographical, literary-historical, and cultural-historical contexts. Conventional genres of literary analysis, including $close readings,$ reviews, and editorial introductions; conventions of organization and prose style in both academic and professional literary discourse; MLA conventions for prose style and documentation.

ENG 206 Studies In Drama. *3(3-0-0) . F,S.* Selected drama from the classical period to the present. Emphasis on reading for enjoyment as well as understanding theory and development of tragedy, comedy, and other modes of dramatic expression. Writers such as Sophocles, Euripides, Shakespeare, Ibsen, and Shaw, and contemporary playwrights.

ENG 207 Studies in Poetry. *3(3-0-0) . F,S.* Main features of poetry such as tone, voice, form, diction, figurative language, and sound patterns. Reading of poetry from different periods with the goal of learning how to understand, appreciate, and analyze different kinds of poems.

ENG 208 Studies In Fiction. *3(3-0-0) . F,S,Sum.* Representative examples of novels and short stories from different periods, emphasizing understanding and appreciation of fiction as a genre, a knowledge of the features and techniques of fiction, and a sense of the development of the genre.

ENG 209 Introduction to Shakespeare. *3(3-0-0) . F,S.* Shakespeare for non-English majors. Seven to ten major plays, including representative comedies, such as The Taming of the Shrew; histories, such as Richard III; tragedies, such as Hamlet; and romances, such as The Tempest.Does not satisfy requirements for English major.

ENG 210 Introduction to Language and Linguistics. *3(3-0-0) . F,S. Preq: ENG 101.* Linguistics theory and method. Topics include the English sound system, morphology, syntactic structure, semantics, and historical and contemporary dialect variation. Language acquisition, language and the brain, and computer processing and human language.

ENG 214 Introduction to Editing. *3(3-0-0) . F,S,Sum. Preq: ENG 101.* Basic editorial skills with a wide range of publications. Stylistic editing (conventions of written English, consistency, effectiveness of syntax, appropriateness of diction), substantive editing (accuracy, legal issues, ethics), and prolunction editing (layout, typography, electronic publication processing).

Introduction to resources such as standard reference works and professional organizations.

ENG 215 Principles of News and Article Writing. *3(3-0-0) . F,S,Sum. Preq: ENG 101.* Techniques of writing news stories and feature articles. Components of newsworthiness, examination of evidence, interview techniques, varied writing styles. Role of newspapers and journalism in America.

ENG 216 Technologies for Texts. *3(1-4-0) . S. Preq: ENG 101.* Uses of computers for creating, designing, analyzing, and disseminating texts, both on desktops and on the Internet. Overview of technologies that facilitate reading, writing, and communication; development of skill with various applications and understanding of their capabilities, limitations, and historical analogues. Recommended for students in journalism and technical writing.

ENG (FL) 219 Studies in Great Works of Non-Western Literature. *3(3-0-0) . F,S.* Readings, in English translation, or non-Western literary masterpieces from the beginnings of literacy in the Middle East, Asia, and Africa to the modern period, including excerpts from texts such as the Upanishads, the Ramayana, the Sundiata, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.

ENG (FL) 220 Studies in Great Works of Western Literature. *3(3-0-0) . F,S,Sum.* Readings, in English translation, of Western literary masterpieces, from the beginnings of literacy in the Middle East and Europe towards the present, including such authors as Homer, Sophocles, Virgil, Ovid, Augustine, Dante, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf.Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222

ENG (FL) 221 Literature of the Western World I. *3(3-0-0) . F.* Readings from English translations of Biblical, Classical, Medieval, and Early Renaissance literature, including works by such authors as Homer, Plato, Virgil, Ovid, St. Paul, St. Augustine, Marie de France, and Dante.

ENG 222 Literature of the Western World II. *3(3-0-0) . S.* Readings from English translations of Renaissance, Neo-Classical, Romantic, and Early Modern literature, emphasizing the cultures of continental Europe from the Renaissance to 1900, and including such authors as Petrarch, Erasmus, Rabelais, Machiavelli, Shakespeare, Moliere, Voltaire, Rousseau, Goethe, Flaubert, and Tolstoy.

ENG (FL) 223 Contemporary World Literature I. *3(3-0-0) . F.* Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

ENG (FL) 224 Contemporary World Literature II. *3(3-0-0) . S.* Twentieth-century literature of some of the following cultures: Asian, Arabian, African, Caribbean, Native-American.

ENG 232 Literature and Medicine. *3(3-0-0) . F,S.* Study of literature about illness, epidemics, and the science and practice of medicine. Readings will include works by authors such as Boccaccio, Defoe, George Eliot, Kafka, William Carlos Williams, Susan Sontag, and Tony Kushner.

ENG 233 The Literature of Agriculture. *3(3-0-0) . S.* A study of writings on the role of farming in the creation of culture and on the connection between the attention to words necessary for good writing and the attention to the land necessary for good farming. Readings may include ancient and modern texts from a variety of cultures and genres. Possible authors include Virgil, Jefferson, Hardy, Cather.

ENG 246 Literature of the Holocaust. *3(3-0-0) . S, Alt yrs.* Fictional and nonfictional versions of the Holocaust, focusing on themes of survival, justice, theology, and the limits of human endurance.

ENG (AFS) 248 Survey of African-American Literature. *3(3-0-0) . F,S.* African-American writing and its relationships to American culture and history. Covers such writers as Wheatley, Douglass, Chesnutt, Dunbar, DuBois, Hughes, Hurston, Wright, and Morrison.

ENG 251 Major British Writers. *3(3-0-0) . F,S,Sum.* Significant British authors chosen from among such figures as Chaucer, Shakespeare, Milton, Swift, Pope, Austen, Wordsworth, Coleridge, Tennyson, Browning, Bronte, Dickens, Joyce, Eliot, Woolf, and Yeats.Credit will not be given for both ENG 251 andeither ENG 261 or 262.

ENG 252 Major American Writers. *3(3-0-0) . F,S,Sum.* Significant American authors chosen from among such figures as Franklin, Emerson, Thoreau, Hawthorne, Melville, Douglass, Stowe, Whitman, Dickinson, Twain, James, Frost, Faulkner, Hemingway, and Morrison.Credit will not be given for both ENG 252 and either ENG 265 or 266.

ENG 260 Introduction to Literary Study. *3(3-0-0) . F,S,Sum. Preq: ENG 101.* Introduces fundamental questions in literary history and critical theory. Emphasizes critical reading skills and prepares students for the kinds of courses--surveys, genre courses, author courses, problem-based courses--that are part of the Englishmajor. Papers prepared using standard word processing programs.

ENG 261 English Literature I. *3(3-0-0) . F,S,Sum.* A survey of English literature to 1660, including Old English, Middle English, and Renaissance writing, focusing on such central authors as Chaucer, Spenser, Marlowe, Shakespeare, Jonson, Donne, and Milton.

ENG 262 English Literature II. *3(3-0-0) . F,S,Sum.* A survey of English literature from 1660 to the present. Poetry, fiction, drama and intellectual prose by such central writers as Dryden, Pope, Swift, Johnson, Wollstonecraft, Wordsworth, Keats, Shelley, Bronte, Carlyle, Tennyson, Browning, Yeats, Woolf, Joyce and Eliot.

ENG 265 American Literature I. *3(3-0-0) . F,S,Sum.* A survey of American literature from the beginnings to the Civil War, including such central authors as Edwards, Franklin, Irving, Emerson, Hawthorne, Melville, Poe, Stowe, Douglass, Thoreau, and Whitman.

ENG 266 American Literature II. *3(3-0-0) . F,S,Sum.* A survey of American literature from the Civil War to the present, including such central authors as Whitman, Dickinson, Twain, James, Crane, Wharton, Frost, Eliot, Hemingway, Hurston, Faulkner, Wright, O'Connor, and Morrison.

ENG 272 Writing About Film. *3(3-0-0) . F, S. Preq: ENG 101.* Comprehensive study of various approaches to writing about film. Primary focus is on the critical and evaluative practice involved in writing film criticism for non-academic audiences. Film screenings, discussion of assigned readings, and in-classwriting workshops aid students in preparing a portfolio of film writing that includes film reviews of various lengths.

ENG 282 Introduction to Film. *3(2-2-0) . F,S.* Examination of basic film techniques and basic methods of film analysis. Emphasis on understanding and appreciating film as a major art form.

ENG 283 Introduction to American Folklore. *3(3-0-0) . S.* Principal types of folklore; field work in collecting and assimilating material from various cultural traditions. Emphasis on American folklore and its origins.

ENG 287 Explorations in Creative Writing. *3(3-0-0) . F,S. Preq: ENG 101.* Introduction to the basic elements and principles of three genres of creative writing: poetry, fiction and drama. Reading and class discussion of student work. Recommended for students with no prior experience in creative writing.

ENG 288 Fiction Writing. *3(3-0-0) . F,S. Preq: ENG 101.* Experience in writing short prose fiction. Class critiquing of student work and instruction in techniques of fiction.

ENG 289 Poetry Writing. *3(3-0-0) . F,S. Preq: ENG 101.* Experience in writing poetry. Class critiquing of student work and instruction in techniques of poetry.

ENG 298 Special Projects in English. *1-3. F,S,Sum.* Faculty-guided independent study, or courses on special topics determined by departmental interest or need.

ENG 301 Critical Approaches to Reading Literature. *3(3-0-0) . F, S. Preq: Sophomore standing.* Intensive study of criticism from the Ancient world through the contemporary period, including ancient, medieval, Renaissance, Romantic, and early modern theories; the modern period is represented by the dominant schools of twentieth-century criticism (e.g. Formalism, Structuralism, Post-structuralism and Deconstruction, Narratology, traditional Historicism, New Historicism, Marxism and Feminism).

ENG (WGS) 305 Women and Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Nineteenth- and twentieth-century womens' literature, as shaped by the intersecting and competing claims of gender, race, sexuality, and culture. Focus on fiction, accompanied by critical readings from American studies, feminist literary criticism,and postmodern theory.

ENG 314 Technical Document Design and Editing. *3(3-0-0) . F,S,Sum. Preq: ENG 214.* Layout and design principles for written documents; desktop building; legibility, readability testing; conventions of proposals, instructions, and reports; basics of technical editing: usage, vocabulary, style manuals, editing mathematical equations, graphs, tables.

ENG 315 Advanced News and Article Writing. *3(3-0-0) . S. Preq: ENG 215.* Advanced work in writing news stories, profiles, features, and investigative stories. Includes analysis and critical reading of print media. Assumes thorough knowledge of AP style and rudiments of news and feature writing.

ENG 317 Designing Web Communication. *3(3-0-0) . F,S. Preq: ENG 214, or ENG 216, or ENG 314.* A course in the layout, design, and composition of web-based communication. Students will learn to analyze audiences and their uses of information in order to plan, compose, and critically evaluate web-based communication. Students will acquire skill with HTML coding, screen design, and multimedia authoring and will apply those skills to the composition of a variety of web texts (i.e. websites). Course work will require students to become proficient with commercially available HTML and photoeditors.

ENG (COM) 321 Survey of Rhetorical Theory. *3(3-0-0) . F. Preq: COM 201.* Principles of rhetorical theory from its classical origins through the modern period to the present time. Key concepts and theories that provide a critical understanding of the processes of persuasive symbol use.

ENG 323 Writing in the Rhetorical Tradition. *3(3-0-0) . F,S,Sum. Preq: ENG 101.* A writing course based on the study of rhetoric. Readings on the principles of invention, arrangement, and style; analysis of written texts; writing of persuasive texts for a variety of audiences and purposes.

ENG 324 Modern English. *3(3-0-0) . F,S. Preq: ENG 101.* Study of Modern English at the sentence level. Analysis of grammatical structure. Consideration of language variation in English.

ENG (FL) 325 Spoken and Written Traditions of American English Dialects. *3(3-0-0) . S. Preq: ENG 101.* Spoken and written traditions of American English. Historical and current factors in dialect diversity, including regional, social, ethnic and stylistic differences. Special attention to African-American and Southern English in both spoken and literary representations of dialects.

ENG 326 History of the English Language. *3(3-0-0) . F,S. Preq: ENG 101.* Development of the English language from its Indo-European origins to the present. Emphasis on historical and comparative linguistic methodology and on changes in sound, syntax, and meaning.

ENG (WGS) 327 Language and Gender. *3(3-0-0) . S. Preq: ENG 101.* Introduction to the use of language by men and women. Research in Linguistics and Women's Studies addressing issues such as the acquisition of gender-differentiated language, gender and conversational interaction, sexism in language, gender issues in society, and the relationship between language, gender, and other social constructs (e.g., class, culture, and ethnicity).

ENG 328 Language and Writing. *3(3-0-0) . S. Preq: ENG 101.* Study of language structure; specific attention to differences between spoken and written language; print conventions; error analysis; and the application of linguistics to rhetoric and composition. Analysis of a variety of grammatical approaches; how to evaluate grammar textbooks and compositions. Intended for English Education majors.Credit will not be awarded for both ENG 328 and ENG 324.

ENG 331 Communication for Engineering and Technology. *3(3-0-0) . F,S,Sum. Preq: Junior standing.* Written communication in industrial and technical organizations, emphasizing internal communication with managers and technical personnel and including external communication with regulators, vendors, and clients. Intensive practice in writing; relationship of writing to oral and visual communication. For students in engineering and other primarily technological curricula.Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.

ENG 332 Communication for Business and Management. *3(3-0-0) . F,S,Sum. Preq: Junior standing.* Written communication in business and public organizations, including both internal communication (such as instructions, policies, management reports) and external communication with clients, vendors, and publics. Intensive practice in writing; relationship of writing to oral and visual communication. For students in business and management-related programs.Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.

ENG 333 Communication for Science and Research. *3(3-0-0) . F,S. Preq: Junior standing.* Written communication in scientific and research contexts, emphasizing relationship between research and writing in problem formulation, interpretation of results, and support and acceptance of research. Intensive practice in writing; relationship of writing to oral and visual communication. For students who plan careers in scientific research.Credit is not allowed for more than one of ENG 331, 332, and 333.

ENG (AFS) 349 African Literature in English. *3(3-0-0) . S. Preq: Sophomore standing.* Anglophone literature in Africa. Emphasis on the relationship between the African world-view and literary production and the persistent trend by African writers to connect literature with politics. Writers such as Achebe, Ngugi, Soyinka, and Serote.

ENG 350 Internship in Writing and Editing. *3(1-10-0) . F,S. Preq: Any two ENG 214, ENG 215, ENG 216, ENG 314, ENG 315, ENG 317, ENG 421.* Directed work experience for English majors including work-site mentoring and evaluation. Department supervision includes course work directed toward designing employment application materials, developing a portfolio of professional work, and reading the literature on workplace socialization.

ENG 362 The British Novel of the 18th Century. *3(3-0-0) . S. Preq: Sophomore standing.* Emphasizes major novelists such as Defoe, Richardson, Fielding, Sterne, and Austen.

ENG 363 The British Novel of the 19th Century. *3(3-0-0) . F. Preq: Sophomore standing.* Emphasizes major novelists such as Dickens, Trollope, the Brontes, Eliot, and Hardy.

ENG (COM) 364 History of Film to 1940. *3(3-0-0) . F. Preq: Junior standing.* Technological developments and aesthetic movements that shaped cinema production and direction from the beginning of the industry to 1940. Evolution in camera movement, editing, sound storyline, and the documentary. Rise to prominence of the Hollywood studio systems and the contributions of foreign filmmakers.

ENG 368 American Poetry to 1900. *3(3-0-0) . S. Preq: Sophomore standing.* American poetry written in English from the colonial period to 1900. Development of styles and themes in relation to historical context. Emphasis on poets such as Bradstreet, Taylor, Wheatley, Poe, Sigourney, Emerson, Longfellow, Whitman, Dickinson, and Robinson.

ENG 369 The American Novel of the 19th Century. *3(3-0-0) . F. Preq: Sophomore standing.* Major novels illustrating the development of American fiction from Romanticism to Realism and Naturalism. Works by such writers as Brown, Cooper, Hawthorne, Stowe, Melville, Twain, Howells, James, Norris, Crane, Chopin, and Dreiser.

ENG 370 Early Twentieth-Century Fiction. *3(3-0-0) . S, Alt yrs. Preq: Sophomore standing.* Study of narrative fiction written during the first half of the twentieth century. Typical subjects: James, Conrad, Stein, Hemingway, Woolf, Faulkner, Hurston, Wright, Beckett.

ENG 371 Late Twentieth-Century Fiction. *3(3-0-0) . S, Alt yrs. Preq: Sophomore standing.* Study of narrative fiction written during the second half of the twentieth century. Typical subjects: Beckett, O'Brien, Welty, O'Connor, Naipaul, Lessing, Gordimer, Morrison, Rushdie, DeLillo, Pynchon, McCarthy.

ENG 372 Early Twentieth-Century Poetry. *3(3-0-0) . F, Alt yrs. Preq: Sophomore standing.* Study of poetry written in English during the first half of the twentieth century. Typical subjects: Hardy, Robinson, Yeats, Eliot, Pound, H.D., Williams, Hughes, Moore, Stevens.

ENG 373 Late Twentieth-Century Poetry. *3(3-0-0) . F, Alt yrs. Preq: Sophomore standing.* Study of poetry written in English during the second half of the twentieth century. Typical subjects: Auden, Lowell, Larkin, Olson, Heaney, Plath, Ginsberg, Smith, Ashbery, Rich, Brooks, Walcott, Lorde.

ENG (COM) 374 History of Film From 1940. *3(3-0-0) . S. Preq: Junior standing.* Technological developments and aesthetic movements that have shaped cinema production and direction from 1940 to the present. Evolution in camera movement, editing, sound, storyline, and the documentary. Post-war decline and re-emergence of the Hollywood film industry and the contributions of foreign filmmakers.

ENG (AFS) 375 African American Cinema. *3(3-0-0) . F.* Survey and analysis of African American film culture from 1900-present. Examination of pre-Hollywood, classical Hollywood, and Independent filmmaking. Particular

focus on independent filmmakers' response to dominant industry representations and the work of filmmakers who seek to create a specifically African American cinematic style.

ENG 376 Science Fiction. *3(3-0-0) . F,S. Preq: Sophomore standing.* Representative works of science fiction. Emphasis on works written in the twentieth century, with some attention to the history and development of the genre.

ENG 377 Fantasy. *3(3-0-0) . . F,S. Preq: Sophomore standing.* Representative works in the genre of fantasy. Emphasis on works of 19th and 20th centuries. Authors such as Carroll, Lewis, Tolkien, Borges, LeGuin, and Gardner.

ENG 380 Modern Drama. *3(3-0-0) . F. Preq: Sophomore standing.* Major plays and playwrights from Ibsen to Pinter, including at least some of the following: Strindberg, Chekhov, Shaw, O'Neill, Hellman, Pirandello, Brecht, Williams, Miller, Albee.

ENG 381 Creative Nonfiction Writing Workshop. *3(3-0-0) . F,S. Preq: ENG 215, 287, 288, or 289.* A workshop in creative nonfiction (literary or magazine journalism) for the student with demonstrated understanding of the basic techniques of creative writing and journalism.

ENG 382 Film and Literature. *3(2-2-0) . F.* Ways of adapting literary works to film form. Similarities and differences between these two media. Emphasis on the practical art of transforming literature into film. Attention to the impact of film upon literature.

ENG 383 Folklore and Literature. *3(3-0-0) . F. Preq: Sophomore standing.* Relationships between traditional culture and written literature. Genre theory; interchanges between print media and oral tradition; nature of plot, character, and form in Western and non-Western cultural traditions; performance theory. Influence of regional traditions and American literature.

ENG 384 Film Theory. *3(3-0-0) . F. Preq: ENG 282.* Survey of critical approaches to film art. Application of theoretical paradigms--formalist, realist, psychoanalytic, feminist, poststructuralist--to individual films, genres, national cinemas and directors.

ENG 385 Biblical Backgrounds of English Literature. *3(3-0-0) . F, Alt. yrs. Preq: Sophomore standing.* Influences of the Bible-principal forms, genres, and texts-on major English and American writers such as Milton, Spenser, Melville, Eliot, and Faulkner.

ENG 388 Intermediate Fiction Writing Workshop. *3(3-0-0) . F,S.* An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing prose fiction.

ENG 389 Intermediate Poetry Writing Workshop. *3(3-0-0) . F,S.* An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing poetry.

ENG 390 Classical Backgrounds of English Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Literature of the ancient Western world and its influence on English and American writing. Emphasis on the connections between the two bodies of literature. Covers such writers as Plato, Horace, Virgil, and St. Augustine.

ENG 391 Special Topics in Modern Drama. *3(3-0-0) . F. Preq: Sophomore standing.* Various topics in modern drama covering different cultures, issues, and theatrical practices within the last 100 years. Modern American drama, modern British drama, modern World Drama, and European theatre from World War II to the present.

ENG (FL) 392 Major World Author. *3(3-0-0) . F,S. Preq: Sophomore standing.* Intensive study in English, of the writings of one (or two) author(s) from outside the English and American traditions. Sample subjects: Homer, Virgil and Ovid, Lady Murasaki, Marie de France and Christine de Pizan, Dante, Cervantes, Goethe, Balzacand Flaubert, Kafka, Proust, Lessing and Gordimer, Borges and Marquez, Neruda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester.May be repeated for credit with new topic.

ENG (FL) 393 Studies in Literary Genre. *3(3-0-0) . F,S. Preq: Sophomore standing.* Concentrated treatment of one literary genre, such as the epic, the lyric, the drama, satire, romance, autobiography, the essay, the novel, or the short story. Treatment of materials from several national or ethnic cultures and several periods. All readings in English. Course may be taken three times for credit.Course may be taken 3 times in different genres.

ENG (FL) 394 Studies in World Literature. *3(3-0-0) . F,S. Preq: Sophomore standing.* Study of a subject in world literature; for example, African literature, Asian literature, Hispanic literature, East European literature, comedy, the epic, the lyric, autobiography, the Faust legend, or metamorphosis. Subjects vary according to availability of faculty. Readings in English translation.

ENG 398 Contemporary Literature I (1900 to 1940). *3(3-0-0) . F. Preq: Sophomore standing.* British and American literature from 1900 to World War II, with representative authors such as Conrad, Yeats, Eliot, Joyce, Woolf, Faulkner, Shaw, Stein, O'Neill, and Wright. For comparative purposes, continental authors such as Kafka and Mann.

ENG 399 Contemporary Literature II (1940 to Present). *3(3-0-0) . S. Preq: Sophomore standing.* Literature from World War II to the present, with representative authors such as Murdoch, Beckett, Nabokov, Ginsberg, Achebe, Fuentes, Kundera, Naipaul, and Morrison.

ENG 400 Applied Criticism. *3(3-0-0) . F. Preq: LTN Majors, Senior standing, formal admission to the methods and student teaching courses. Coreq: ECI 450.* Types and methods of literary criticism designed specifically for students intending to teach English in high school.

ENG (ECI) 405 Literature for Adolescents. *3(3-0-0) . F. Preq: Junior standing.* The history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum.

ENG (FL) 406 Modernism. *3(0-0-0) . F. Preq: Sophomore standing.* International Modernist movement in literature, from its nineteenth-century origins to its culmination in the early twentieth century. Definitions of modernity, as embodied in a variety of genres. Placement of Modernist texts within a variety of cultures that produced them.

ENG (FL) 407 Postmodernism. *3(3-0-0) . S. Preq: Sophomore standing.* Literary expressions of Postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century. Definitions of postmodernity, as embodied in a variety of genres. Placement of Postmodernist texts within a variety of cultures that have produced them.

ENG (WGS) 410 Studies in Gender and Genre. *3(3-0-0) . F. Preq: Sophomore standing.* This course examines the ways in which writers have revised the literary genres to include gendered experience. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

ENG (COM) 411 Rhetorical Criticism. *3(3-0-0) . S.* Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramatistic analysis, content analysis, fantasy theme analysis.

ENG 417 Editorial and Opinion Writing. *3(3-0-0) . S. Preq: ENG 214, ENG 215.* Discussing and writing newspaper and magazine editorials, with added attention to other forms of opinion in print, such as columns and books and music reviews.

ENG 420 Major American Author. *3(3-0-0) . F. Preq: Sophomore standing.* Intensive study of the writings of one (or two) American author(s). Developments across the career, relationships between the writing and the life, the writer's participation in a culture and an historical moment. Sample subjects: Emerson and Thoreau, Melville, Whitman, Stowe and Douglass, Dickinson, Twain, James and Wharton, Frost, O'Neill, Fitzgerald and Hemingway, Faulkner, Hurston and Wright, O'Conner, Morrison.

ENG 421 Computer Documentation Design. *3(3-0-0) . F. Preq: ENG 314, 331, 332 or ENG 333.* Theory and design of documentation for computer hardware and software, including user guides, reference manuals, quick reference guides, tutorials, online documentation, and CD-based media delivery. Training in alternative documentation testing procedures, usability testing, and collaborative revision.

ENG 422 Writing Theory and the Writing Process. *3(3-0-0) . F,S. Preq: ENG 101.* Theory and research on the processes and contexts of written

discourse; cognitive, socio-cultural, educational perspectives; reflective and research-based accounts of the writing process; analysis of discourse contexts and communities.

ENG 425 Analysis of Scientific and Technical Writing. *3(3-0-0) . S. Preq: ENG 314, 331, 332, or 333.* The role of communication in the creation of scientific knowledge and technical designs and artifacts; methods of analyzing texts and of studying their creation and use; relationships between writing and other forms of communication. Field research in a scientific or technological setting.

ENG 426 Analyzing Style. *3(3-0-0) . F,S. Preq: ENG 101.* Development of a greater understanding of and facility with style in written discourse. Theories of style, stylistic features; methods of analysis, imitation.

ENG 433 Screenwriting. *3(3-0-0) . S. Alt yrs. Preq: 6 credit hours from courses in writing for media, creative writing, or Film Studies.* Writing for films, story planning, character development, communicating information, building scenes, relationships between script and cinematic dimensions, working with studios and editors.

ENG 439 17th-Century English Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Works of major nondramatic literary figures in England during the period 1600-1700, such as Donne, Jonson, Herbert, Marvell, Bacon, and Browne.

ENG (AFS) 448 African-American Literature. *3(3-0-0) . S. Preq: Junior standing.* Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Huston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

ENG 449 16th-Century English Literature. *3(3-0-0) . F. Preq: Sophomore standing.* Nondramatic prose and poetry of the sixteenth century, with consideration of literary types and movements. Emphasis on major authors, including Sidney and Spenser.

ENG 451 Chaucer. *3(3-0-0) . F,S. Preq: Sophomore standing.* Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales.

ENG 452 Medieval British Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Readings in the rich poetic, thematic, and generic diversity of Medieval British literature. Representative selections from romance, dream-vision, allegory, fabliau, lyric, chronicle, saint's life, satire, in historical and cultural contexts. Priorknowledge of Middle English unnecessary.

ENG 453 The Romantic Period. *3(3-0-0) . F. Preq: Sophomore standing.* Emphasis on the major poetry of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats, with selected readings from other poets, prose writers, and dramatists of the period.

ENG 455 Literacy in the U.S.. *3(3-0-0) . S. Preq: ENG 101; Junior or senior standing..* Academic study of the nature, functions, acquisition, institutionalization, and present state of literacy in the U.S., with special focus on issues of cultural diversity and social inequity. Three contexts for literacy - personal, academic, and home/community - provide a range of readings, investigations, and opportunities for reflection and further study. Service-learning component links this academic study to required tutoring (2 hours per week) of children and adults in local community service agencies in addition to attending class. Students will need to provide their own transportation.

ENG 460 Major British Author. *3(3-0-0) . S. Preq: Sophomore standing.* In-depth study of the works of one (or two) British author(s) within their historical and literary-historical context. Sample authors might include; Spenser and Sidney, Swift and Pope, Austen, Wordsworth and Coleridge, Keats and Shelley, the Brontes, the Brownings, Dickens, George Eliot, Hardy, Joyce, Woolf.

ENG 462 18th-Century English Literature. *3(3-0-0) . F. Preq: Sophomore standing.* Major figures in English literature between 1660 and 1790. Works studied in relation to social, cultural, political, and religious developments. Emphasis on writers such as Dryden, Swift, Pope, Johnson.

ENG 463 The Victorian Period. *3(3-0-0) . S. Preq: Sophomore standing.* Significant British poets, writers of prose non-fiction, and novelists studied in the social, economic, scientific, intellectual, and theological contexts of the Victorian era.

ENG 464 British Literature, 1900-1945. *3(3-0-0) . S, Alt. yrs. Preq: Sophomore standing.* Variety of writings by British authors between the death of Queen Victoria and the end of World War II. Typical subjects: Hardy, Conrad, Shaw, Yeats, Forster, Joyce, Lawrence, Eliot, Woolf, Beckett.

ENG 465 British Literature, Since 1945. *3(3-0-0) . S, Alt. yrs. Preq: Sophomore standing.* Study of a variety of writings by British authors since World War II. Typical subjects: Beckett, O'Brien, Orwell, Lessing, Murdoch, Rhys, Auden, Larkin, Osborne, Rushdie.

ENG 467 American Colonial Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Survey of American literature and thought from its beginnings to the adoption of the Constitution. Representative works such as travel and exploration reports, Indian captivity narratives, diaries, journals, autobiographies, sermons, and poetry.

ENG 468 American Romantics. *3(3-0-0) . F. Preq: Sophomore standing.* Major American writers from 1825 to 1865. Relationship between literary developments and social change. Emphasis on such writers as Emerson, Hawthorne, Cooper, Poe, Melville, Douglass, Stowe, Thoreau, and Whitman.

ENG 469 American Realism and Naturalism. *3(3-0-0) . S. Preq: Sophomore standing.* Major American writers from 1865 to 1914, with emphasis on novelists such as Twain, James, Howells, Chopin, and Dreiser.

ENG 470 American Literature, 1914-1945. *3(3-0-0) . F, Alt yrs. Preq: Sophomore standing.* Variety of writings by U.S. authors from World War I to World War II. Typical subjects: Stein, Adams, Anderson, Williams, Cullen, Hilda Doolittle, Faulkner, Hurston, Hemingway, Fitzgerald, Frost, O'Neill.

ENG 471 American Literature, Since 1945. *3(3-0-0) . F, Alt yrs. Preq: Sophomore standing.* Study of a variety of writings by U.S. authors since World War II. Typical subjects: Ellison, Lowell, Williams, Welty, Bellow, Baldwin, O'Conner, Barthelme, Albee, Mailer, Ashbery, Morrison, McDermott, DeLillo.

ENG 475 Literature, the Arts, and Mass Culture. *3(3-0-0) . F,S.* A review of the debate regarding art and mass culture, with attention to recent developments in cultural theory and practice.

ENG 476 Southern Literature. *3(3-0-0) . F. Preq: Sophomore standing.* Literary traditions of the Southeastern United States from colonization through the present, including study of such major writers as Byrd, Jefferson, Simms, Poe, Douglass, Twain, Chesnutt, Glasgow, Hurston, Tate, Wolfe, Faulkner, Warren, Wright, Welty, Williams, O'Conner, Percy, and Lee Smith.

ENG 486 Shakespeare, The Earlier Plays. *3(3-0-0) . F. Preq: Sophomore standing.* Shakespeare's major works before 1600 with emphasis on his development as a playwright.

ENG 487 Shakespeare, The Later Plays. *3(3-0-0) . S. Preq: Sophomore standing.* Shakespeare's major works after 1600 with emphasis on his tragedies and the late romances.

ENG 488 Advanced Fiction Writing Workshop. *3(3-0-0) . S. Preq: ENG 388.* An advanced workshop in creative writing for students with demonstrated understanding and accomplishment in the techniques of writing prose fiction.This course is restricted to juniors and seniors. Departmental approval required.

ENG 489 Advanced Poetry Writing Workshop. *3(3-0-0) . S. Preq: ENG 389.* An advanced workshop in creative writing for the students with demonstrated understanding and accomplishment in the techniques of writing poetry.This course is restricted to juniors and seniors. Departmental approval required.

ENG 490 Studies in Medieval Literature. *3(3-0-0) . F. Preq: Sophomore standing.* Topics (in rotation) in medieval English and continental literature, such as Arthurian legend and literature; women in medieval society and literature; the self in the late Middle Ages. Focus on special areas of interest, with attention to culturaland historical backgrounds and contemporary scholarship. Some texts in Middle English, some in translation; no prior knowledge of Middle English needed.

ENG 491 Honors in English. *3(3-0-0) . F,S. Preq: English Majors.* Intensive course or independent study project designed as one portion of the Honors Program in English. Subject varies.

ENG 492 Special Topics in Film Styles and Genres. *3(2-2-0) . S.* Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester.

ENG 493 Special Topics in Folklore. *3(3-0-0) . S.* Topics and genres in folklore, such as Folktale and Legend, Folklore and Religion, African-American Folklore. Topics will vary from semester to semester.

ENG 494 Special Topics in Linguistics. *3(3-0-0) . S. Preq: ENG 101.* (May be repeated for credit with new topic.) Methodology and analysis within various branches of linguistics, e.g. syntax, semantics, computational linguistics, phonology, dialectology, historical linguistics, discourse analysis. Examination of topic's basic methods, controversial issues, analysis of linguistic data. Projects may include novel analyses of English constructions, parsing programs, field work reports.

ENG 495 Seminar in Writing and Editing. *3(3-0-0) . F,S. Preq: Senior standing in LWE.* Applies principles and experiences gained in previous study to practical problems and projects such as document design and production, document testing, professional ethics, literacy education, and style analysis and evaluation.

ENG 496 Seminar in Literary Criticism. *3(3-0-0) . F,S. Preq: 9 hours of literature at the 300 level or above.* Introduction to theoretical and applied criticism of literature, primarily for English majors and minors. May include traditional theory from Plato and Aristotle to New Criticism, as well as contemporary psychoanalytical, social, historical, and linguistic approaches to literature.

ENG (FL) 497 Senior Seminar in World Literature. *3(3-0-0) . S. Preq: Junior standing or Senior standing.* Rotating topics in world literature, including treatment of materials from more than one culture and including consideration of the subject's theoretical or methodological framework. Readings in English (original languages encouraged but not required).

ENG 498 Special Topics in English. *1-6. F,S,Sum. Preq: Six hours in ENG above the 100 level.* Directed individual study or experimental course offerings in language or literature. Individual study arranged through consultation with faculty member and Director of Undergraduate Studies.

ENG 499 Special Topics in Creative Writing. *3(3-0-0) . F,S. Preq: ENG 288 or ENG 289 ; Students must have earned a grade of "B" or better in 288 or 289 or they must have demonstrated competence in creative writing as determined by instructor.* Techniques and practice in writing a particular form within the traditional genres of poetry, prose, or drama, such as "Creative Non-Fiction," "Science Fiction," "The Novella," or "The Satirical Poem." Topics vary from semester to semester.

ENTOMOLOGY

ENT 201 Insects and People. *3(3-0-0) . S.* Introduction to the fascinating world of insects and how they interact with people. Survey of insect history, diversity, structure and function, and behavior. Examples of harmful and beneficial insects in a variety of human activities concluding with some profound impacts insects have had on history, society and culture.

ENT 203 An Introduction to the Honey Bee and Beekeeping. *3(3-0-0) . F.* Introduction to honey bee biology and a fundamental understanding of beekeeping management including crop pollination by bees. Examination of the relationships between honey bees and humans from prehistoric through modern times and the behavior andsocial system of one of the animal world's most complex and highly organized non-human societies.

ENT 305 Introduction to Forensic Entomology. *3(3-0-0) . S.* This course provides a broad overview of forensic entomology-a specialized field of entomology employed in medicocriminal investigations. Forensic entomology relies on knowledge of insect ecology, biology, taxonomy, physiology and development to elucidate the circumstances surrounding death. The role of arthropods associated with decomposed human remains is one of several valued disciplines in forensic sciences. Understanding the general principles of forensic entomology and their application will be the focus of this course.

ENT 401 Advanced Beekeeping. *3(2-3-0) . S. Preq: ENT 203.* A hands-on course in honey bee management including bee pollination of selected crops based on an understanding of bee biology, bee behavior, bee pathology, and bee botany.Credit not allowed for both ENT 401 and ENT 501.

ENT (FOR) 402 Forest Entomology. *3(2-2-0) . S. Preq: Junior standing and BIO 125.* Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.

ENT (ZO) 425 General Entomology. *3(2-3-0) . F. Preq: ZO 150.* Explores the science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and control of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments.

ENT 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ENT 493 Special Problems in Entomology. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

ENT 495 Special Topics in Entomology. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

OCCUPATIONAL EDUCATION

EOE 101 Introduction to Occupational Education. *1(1-0-0) . F.* Orientation to occupational teacher education curricula. Overview of philosophy, objectives and scope of occupational education programs in the public schools; multi-cultural and individual differences of students. Orientation to microcomputers and their potential uses by occupational education teachers.

EOE 241 Foundations of Marketing Education. *2(2-0-0) . F.* An introduction to Marketing Education and its role in secondary, postsecondary, and adult education.

EOE 298 Special Topics in Occupational Education. *1-3. F,S,Sum.* Individual or group study of particular areas of education at the freshman and sophomore levels.

EOE 307 Field Work in Occupational Education. *2-6. F,S,Sum. Preq: Sophomore standing and consent of instructor.* A supervised off-campus field experience in Occupational Education that relates on-the-job experiences in the field to the technical competencies which are the content of the curriculum.May be repeated for a maximum of 6 credits.

EOE 444 Administration of Marketing Education. *3(3-0-0) . F, Alt. yrs. Preq: EOE 241 and admission to teacher education candidacy.* The theory and skills necessary to plan, administer, and evaluate effective programs in Marketing Education classroom. Student teachers spend ten weeks full-time in a public school: observing, teaching, and participating in the total school program.

EOE 452 Lab Planning in Technology Education. *3(1-4-0) . S. Preq: Senior standing. Coreq: EOE 457 or 307.* Laboratory planning, management, and safety for technology education. Physical layout, selection, specification, and cost of equipment; the safe operation, repair and maintenance of both power and hand tools; specification of expendable supplies, estimating, and ordering.

EOE 456 Curriculum and Methods in Technology Education. *3(2-2-0) . F. Preq: Admittance to teacher education candidacy; Technology Education majors.* Methods of teaching technology education. Emphasis on curriculum development, instructional methods, laboratory instruction, meeting needs of special populations, and management of student organizations.

EOE 457 Student Teaching in Technology Education. *3-8. S. Preq: Admission to professional semester. Coreq: EOE 452 and EOE 495.* Skills and techniques involved in teaching technology education through practice in a public school setting.

ENVIRONMENTAL SCIENCE

ES 100 Introduction to Environmental Sciences. *3(3-0-0) .* Environmental Science majors only, permission of instructor. Interrelationships between human populations and the natural environment. Human population trends, agriculture, air and water pollution, biological diversity, forest and land use, energyand mineral resources, and toxic substances. Consideration of related economic factors, laws, politics, political behavior, and ethical questions.

ENVIRONMENTAL TECHNOLOGY

ET 201 Environmental Technology Laboratory I. *1(0-3-0) . F.* Use of field and laboratory instrumentation for monitoring water quantity and quality. Management, analysis, interpretation, and oral and written reporting of complex environmental data sets. Hands-on, real-world experience in water quality monitoring and maintenance. Required field trips may extend beyond class time.

ET 202 Environmental Technology Laboratory II. *1(0-3-0) . S.* Use of field and laboratory instrumentation for monitoring plants, soils, and natural systems. Management, analysis, interpretation, and oral and written reporting of complex environmental datasets. Hands-on, real-world experience in plant and soil quality monitoring and maintenance. Required field trips may extend beyond class time.

ET 252 Introduction to Spatial Technologies. *3(2-3-0) . S.* Introduction to types of spatial information technologies and their uses in environmental assessments. Topics include: map reading, geographic positioning systems, geographic information systems, and remote sensing. This course will provide a basic overview of these technologies through lectures, and will afford an exposure to their uses through a series of structured laboratory exercises.

ET 301 Environmental Technology Laboratory III. *1(0-3-0) . F.* Assessment of and response to environmental hazards caused by hazardous materials releases. Regulatory requirements associated with hazardous materials releases. Utilization of chemical protective clothing and respiratory protection. Students passing the class receive Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) certification. Required field trips may extend beyond lab time.

ET 302 Environmental Technology Laboratory IV. *1(0-3-0) . S.* Use of field and laboratory instrumentation for monitoring outdoor and indoor air quality. Management, analysis, interpretation, and oral and written reporting of complex environmental data sets. Hands-on, real-world experience in air quality monitoring and maintenance. Required field trips may extend beyond class time.

ET 303 Laboratory Safety Systems and Management. *1(0-3-0) . F.* Theory and practice of regulation, management, and auditing of laboratory safety. Laboratory field trips may extend beyond class time.

ET 310 Environmental Monitoring and Analysis. *3(3-0-0) . S. Preq: CH 202, CH 220, and (CH 315 or CH 223).* Monitoring and analysis of chemical, biological, and radiation impacts to the environment. Theory of chemical, physical, biological, and ecological monitoring. Planning and conducting environmental sampling and monitoring programs. Management, analysis, and quality assurance and control. Risk assessment in environmental technology. Laboratory practice and safety.

ET (MEA) 320 Fundamentals of Air Pollution. *4(3-3-0) . S. Preq: MA 121 or MA 131 or MA 141, CH 201, PY 131 or PY 201 or PY 205 or PY 211.* Air pollution sources, and the influence of natural and anthropogaoic processes on the atmosphere. Roles of local, state and federal governments in air pollution control and importance of the Clean Air Act and it amendments. Techniques for measurement of atmosphere pollutant concentrations and determination of local and regional air quality. Required field trips may extend beyond class time.

ET 330 Environmental Technology Practicum. *3(0-10-0) . Sum.* Preparation for practicum, including resume writing, interviewing skills, cover letters, and practicum search techniques and resources. Professional practice as an environmental technologist. Written and oral communications of the practicum experience.

ET 401 Environmental Technology Laboratory V. *1(0-3-0) . F.* Scientific and legal definitions of brownfield and EPA Superfund sites. Physical, chemical, and biological methods for remediating contaminated sites. Impacts of hazardous waste management on public and private sector organizations. Field trips to public and private brownfield and Superfund remediation sites to examine real-world applications of principles. Required field trips may extend beyond class time.

ET 410 Toxic Substances and Society. *3(3-0-0) . S. Preq: Junior standing.* Interdisciplinary evaluation of past, present and future effects of toxic substances in the environment. Addresses various dimensions of toxic substances; special emphasis on ways to minimize adverse effects in contemporary and future societies.

ET 450 Environmental Regulation. *3(3-0-0) . S. Preq: PS 320 or ARE 309.* Origin and evolution of environmental regulation. Environmental protection statues administered by the EPA and the state of North Carolina. The interplay among science, values, and power within diverse environmental decision contexts. Relationships between regulators and the regulated. Civil enforcement, administrative enforcement, criminal enforcement, and citizens' suits. Real-world environmental regulatory compliance and enforcement issues.

ET 460 Practice of Environmental Technology. *3(3-0-0) . S. Preq: ET 310.* Preparation and presentation of comprehensive environmental assessments and analyses. Critical roles of quality control and assurance. The ISO 14000 environmental management standard of the American National Standards Institute (ANSI). Preparation for certification as an environmental auditor by ANSI and registration as an Environmental Professional by the National Register of Environmental Professionals. Optional training and exams for Environmental Auditors Registration Association and American National Standards Institute/Register Accreditation Board Written Examination available.

ET 470 Environmental Forensics. *3(3-0-0) . F. Preq: ET 252, ET 301, ET 310.* Use of site assessment methodologies and state of the art technologies from analytical chemistry, molecular biology, biogeochemistry, and GIS to solve environmental cases of $Who done it?$ with regards to soil/sediment, water, and air contamination.Two field trips which may extend beyond class time are required.

ET 490 Senior Seminar in Environmental Technology. *1(1-0-0) . S. Preq: Graduate standing.* Weekly departmental and university seminars and group discussions to enrich and broaden student perspectives on the practice and development of environmental technology. Oral and written reporting of seminars topics.

FOREIGN LANGUAGES AND LITERATURES

FL 215 Discovering France. *3(3-0-0) . S.* A wide-ranging exploration of the French experience--from the glories of the past to the uncertainties of the future. Examination of social, political, economic, and cultural issues, with guest speakers offering complementary perspectives. Specialemphasis on the role of France and the French cultural heritage in today's rapidly changing world. Course taught in English.

FL 216 Art and Society in France. *3(3-0-0) . F.* An overview of the visual arts in France, defined broadly, and their relationship to French society and culture: painting, architecture, photography, cinema, book production, gardens, fashion, food, television, popular culture, and mass media, including the Internet. The principla themes of the course are how France's cultural heritage is embodied in its rich tradition of visual expression and how artists' visual expressions have either served to represent, glorify, or critique the nation.

FL (ENG) 219 Studies in Great Works of Non-Western Literature. *3(3-0-0) . F,S.* Readings, in English translation, or non-Western literary masterpieces from the beginnings of literacy in the Middle East, Asia, and Africa to the modern period, including excerpts from texts such as the Upanishads, the Ramayana, the Sundiata, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.

FL (ENG) 220 Studies in Great Works of Western Literature. *3(3-0-0) . F.S.Sum.* Readings, in English translation, of Western literary masterpieces, from the beginnings of literacy in the Middle East and Europe towards the present, including such authors as Homer, Sophocles, Virgil, Ovid, Augustine, Dante, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf.Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222.

FL (ENG) 221 Literature of the Western World I. *3(3-0-0) . F.* Readings from English translations of Biblical, Classical, Medieval, and Early Renaissance literature, including works by such authors as Homer, Plato, Virgil, Ovid, St. Paul, St. Augustine, Marie de France, and Dante.

FL 222 Literature of the Western World II. *3(3-0-0) . S.* Readings from English translations of Renaissance, Neo-Classical, Romantic, and Early Modern literature, emphasizing the cultures of continental Europe from the Renaissance to 1900, and including such authors as Petrarch, Erasmus, Rabelais, Machiavelli, Shakespeare, Moliere, Voltaire, Rousseau, Goethe, Flaubert, Tolstoy.

FL (ENG) 223 Contemporary World Literature I. *3(3-0-0) . F. Preq: ENG 112.* Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

FL (ENG) 224 Contemporary World Literature II. *3(3-0-0) . S. Preq: ENG 112.* Twentieth-century literature of some of the following cultures: Asian, Arabian, African, Caribbean, Native-American.

FL 295 Special Topics in Foreign Languages and/or Literatures. *3(3-0-0) . F.S.Sum. Preq: Departmental approval required.* A special projects course on topics to be determined as needed in the departmental program.

FL 298 Independent Study in Foreign Language or Literature. *1-6. F.S.Sun, Preq: Departmental approval required.* Individualized study in a foreign language or literature. Topic, mode of study and credit hours to be determined in consultation with the faculty member supervising work.

FL 350 Modern European Literary Criticism. *3(3-0-0) . Preq: 6 hours of any 300-level literature courses.* Study of theoretical and philosophical foundations and applied methods in major currents of modern European literary criticism. Includes structuralism, poststructuralism, feminism, and psychoanalytical and ideological criticism. Examination of critical works and application to literary texts. Course taught in English.

FL (ENG) 392 Major World Author. *3(3-0-0) . F.S.* Intensive study in English, of the writings of one (or two) author(s) from outside the English and American traditions. Sample subjects: Homer, Virgil and Ovid, Lady Murasaki, Marie de France and Christine de Pizan, Dante, Cervantes, Goethe, Balzacand Flaubert, Kafka, Proust, Lessing and Gordimer, Borges and Marquez, Neruda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester.May be repeated for credit with new topic.

FL (ENG) 393 Studies in Literary Genre. *3(3-0-0) . F.S.* Concentrated treatment of one literary genre, such as the epic, the lyric, the drama, satire, romance, autobiography, the essay, the novel, or the short story. Treatment of materials from several national or ethnic cultures and several periods. All readings in English. Course may be taken three times for credit.Course may be taken 3 times in different genres.

FL (ENG) 394 Studies in World Literature. *3(3-0-0) . Preq: ENG 111 and 112 or 113.* Study of a subject in world literature: for example, African literature, Asian literature, Hispanic literature, East European literature, Comedy, the Epic, the Lyric, Autobiography, the Faust legend, or Metamorphosis. Subjects vary according to availability of faculty. Readings in English translation.

FL 395 Study Abroad Programs. *1-3.* Specific category of courses involving language and/or culture taught in foreign countries through the Department Study Abroad Program.

FL (ENG) 406 Modernism. *3(3-0-0) .* International Modernist movement in literature, from its nineteenth-century origins to its culmination in the early twentieth century. Definitions of modernity, as embodied in a variety of genres. Placement of Modernist texts within a variety of cultures that produced them.

FL (ENG) 407 Postmodernism. *3(3-0-0) .* Literary expressions of Postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century. Definitions of post modernity, as embodied in a variety of genres. Placement of Postmodernist texts within a variety of cultures that have produced them.

FL 424 Linguistics for ESL Professionals. *3(3-0-0) . F. Preq: Admission to ESL teacher licensure candidacy. Coreq: NC teacher licensure in any area.* Study of the diachronic nature of language and the phonological, morphological, syntactic, and semantic features of English in relation to other world language groups. Application of linguistic principles to the ESL classroom. Analysis of English speech and writing patterns of non-native speakers. Examination of the ways children, adolescents, and adults learn a second language.

FL (ECI) 425 Methods and Materials in Teaching English as a Second Language. *3(3-0-0) . S. Preq: Admission to Teacher Education Candidacy or admission to ESL Licensure Program.* Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools.

FL 439 Perspectives on English as a New Language. *3(3-0-0) . F. Preq: Admission to ESL Teacher Licensure. Coreq: NC teaching license in any area.* Examination of the complexity of multiculturalism in American society and the challenges faced by immigrant families in adapting to U.S. institutions. Emphasis on understanding historical, legal, cultural and pedagogical issues with respect to learning English as a new language (ENL).

FL (ECI) 440 Internship in Teaching English as a Second Language. *1-3. Sum. Preq: Admission to ESL Licensure Program. Coreq: Teacher Licensure in any primary area.* Skills and techniques required in teaching ESL in a public school setting. 15 hours of classroom observation and 30 hours in direct instruction. Demonstration of competencies essential for teaching ESL.

FL 495 Special Topics in Foreign Languages and Literatures. *3(3-0-0) . Preq: Departmental approval required.* A concentrated study of a special period, author or genre to be determined as needed in the departmental program.

FL (ENG) 497 Senior Seminar in World Literature. *3(3-0-0) . S. Preq: Junior standing or Senior standing.* Rotating topics in world literature, including treatment of materials from more than one culture and including consideration of the subject's theoretical or methodological framework. Readings in English (original languages encouraged but not required).

FL 498 Independent Study in Foreign Language or Literature. *1-6. F.S,Sun. Preq: Departmental approval required.* Individualized study of a foreign language or literature. Topic, mode of study, and credit hours to be determined in consultation with the faculty member supervising work.

ARABIC

FLA 101 Beginning Arabic 101. *3(3-0-0) . F.* Beginning Arabic is for students who have had no prior experience with the language. It is the first in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. Authentic materials from the Arabic media will be used in addition to text-related video and audio materials. An introduction to Arab culture will be integrated throughout the semester.This course is designed for true beginners who have had no previous experience with the Arabic language, either written or spoken. Credit will be allowed for either FLA 101 or FLA 111, but nor for both.

FLA 102 Beginning Arabic 102. *3(3-0-0) . S. Preq: FLA 101 or 111.* This course is the second in a series which develops reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. Authentic materials from the Arabic media will be used in addition to text-related video and audio materials. An introduction to Arab culture will be integrated throughout the semester.Credit will be allowed for either FLA 102 or FLA 112, but not for both.

FLA 111 Advanced Beginning Arabic 111. *3(3-0-0) . F.* Advanced Beginning Arabic 111 is a beginning course of language study for students who have some knowledge of an Arabic dialect, but have not yet learned to read or write in Arabic. This is the first in a series of courses which develops strong reading, writing, listening and speaking skills in Modern Standard Arabic. In addition to the standard course texts, authentic materials from the Arabic media will be used as well as text-related video and audio materials.FLA 111 and FLA 112 can meet university foreign language requirements instead of FLA 101 and

FLA 102. Credit will be allowed for either FLA 111 or FLA 101, but not for both.

FLA 112 Advanced Beginning Arabic 112. *3(3-0-0) . S. Preq: FLA 111 or FLA 101.* Continuation of Advanced Beginning Arabic 111. This course further develops strong reading, writing, listening and speaking skills in Modern Standard Arabic for those who have previous knowledge of an Arabic dialect. In addition to the standard course texts, authentic materials from the Arabic media will be used as well as text-related video and audio materials.FLA 111 and FLA 112 can meet university foreign language requirements instead of FLA 101 and FLA 102. Credit will be allowed for either FLA 112 or FLA 102, but not for both.

FLA 201 Intermediate Arabic I. *3(3-0-0) . F. Preq: FLA 102 or FLA 112.* Intermediate Arabic I is the third in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. An increased emphasis is placed onthe acquisition of vocabulary and grammatical tools necessary to undertake more in-depth readings and discussions of news articles from the Arab media. Authentic materials from the Arab media will be used in addition to text-related video and audio materials.

FLA 202 Intermediate Arabic II. *3(3-0-0) . S. Preq: FLA 201.* Intermediate Arabic II is the fourth in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. A continued emphasis is placed on the acquisition of vocabulary and grammatical tools necessary to undertake more in-depth readings and discussions of news articles from the Arab media. Authentic materials from the Arab media will be used in addition to text-related video and audiomaterials.

CHINESE

FLC 101 Elementary Chinese I. *3(3-0-0) . F.* Introduction to Modern Standard Chinese. Emphasis on speaking and listening with an introduction to reading, writing and Chinese culture.

FLC 102 Elementary Chinese II. *3(3-0-0) . S. Preq: FLC 101.* Continuation of basic skills. Emphasis on speaking and listening with some reading, writing and Chinese culture.

FLC 105 Intensive Elementary Chinese. *6(6-0-0) .* Intensive introduction to Modern Standard Chinese. Emphasis on speaking and listening with an introduction to reading, writing and Chinese culture.

FLC 201 Intermediate Chinese I. *3(3-0-0) . F. Preq: FLC 102.* Continuation of basic skills. Greater emphasis on reading, writing and Chinese cultural traditions.

FLC 202 Intermediate Chinese II. *3(3-0-0) . S. Preq: FLC 201.* Continuation of basic skills. Focus on reading, writing, Chinese cultural traditions and patterns of behavior.

FLC 301 Intermediate Chinese III. *3(3-0-0) . F. Preq: FLC 202.* Last of the foundation courses in Chinese. Continued practice in speaking and understanding Chinese with new emphasis on writing and on the reading of cultural and literary texts.

FLC 302 Intermediate Chinese IV. *3(3-0-0) . S. Preq: FLC 301.* Continued practice in speaking and understanding Chinese with greater emphasis on reading and writing. Continued study of cultural and literary texts.

ENGLISH (FOREIGN LANGUAGE)

FLE 100 Introduction to Academic Writing. *4(4-0-0) . F,S.* For non-native speakers of English. Intensive introduction to critical writing and reading in academic contexts. Exploration of writing processes and academic literacy skills: interpreting assignments; comprehending, analyzing, and evaluating college-level texts; inventing, drafting, and revising; seeking, providing, and responding to constructive feedback; collaborating effectively under varied learning models. Extensive writing practice and individualized coaching. Attention to grammar and conventions of standard written English. Intended as preparation for FLE 101.Only for non-native speakers of English. Requires C- or better. Credit for FLE 100 is not allowed if student has prior credit for FLE 101

FLE 101 Academic Writing and Research. *4(4-0-0) . F,S. Preq: Grade of C- or better in FLE 100 or placement via ESL testing guidelines.* For non-native speakers of English intensive instruction in academic writing and research. Basic principles of rhetoric and strategies for academic inquiry and argument. Instruction and practice in critical reading, including the generative and responsible use of print and electronic sources for academic research, adapted for non-native speakers. Exploration of literate practices across a range of academic domains, laying the foundation for further writing development in college. Continued attention to grammar and conventions of standard written English. Satisfies freshman English requirements.

FLE 110 Developmental Written English for International Students. *3(3-0-0) . F,S.* Development of basic writing skills through supervised writing, analyzed reading, and self-paced drills, Focus on basic elements of English grammar important for non-native speakers and on the mechanics of writing, such as spelling, capitalization, and punctuation. Vocabulary study, composition of sentences, simple paragraphs, and short essays. Introduction to the writing process.

FLE 201 Oral Communication in English for International Students. *3(3-0-0) . F,S.* Oral communication in English; active and interactive speaking skills, listening comprehension and reading. Specific tasks in spoken English such as communicating information, making inquiries, requests and complaints. Individual and group work inthe form of oral reports, role play, presentations, etc. Listening to lectures and note taking skills.

FLE 400 American English Pronunciation for International Students. *3(3-0-0) . F,S.* Intensive pronunciation practice for non-native speakers of English. Emphasis on improved intelligibility through practice on English rhythm, stress and intonation. Individual and class work on vowel and consonant difficulties.

FLE 401 Advanced Oral Communication in English for International Students. *3(3-0-0) . F,S.* Oral communication in English; pronunciation skills, reading, aural comprehension and oral skills; communication strategies and cross-cultural communication; individual and group activities such as presenting information, teaching a class, fielding questions and leading a discussion.

FLE 402 Advanced Written Communication in English for International Students. *3(3-0-0) . F,S.* Written communication skills for graduate students; integrated writing tasks focusing on writing, reading, grammar and comprehension, specifically geared to the needs of research students and teaching assistants. Reading, critical analysis and synthesis of written material such as journal articles, research reports, etc.

FRENCH

FLF 101 Elementary French I. *3(3-0-0) . F,S,Sum.* First in a four-course sequence to develop language skills. Oral and written practice in classroom and language laboratory. Readings in French culture and civilization.

FLF 102 Elementary French II. *3(3-0-0) . F,S,Sum. Preq: FLF 101.* Continuation of FLF 101 with intensive practice in spoken French. Readings in French culture and civilization.

FLF 105 Intensive Elementary French. *6(6-0-0) .* An intensive course aimed at developing a balanced foundation in listening, speaking, reading, and writing French. Equivalent to FLF 101 plus FLF 102.

FLF 110 Accelerated Elementary French. *3(3-0-0) . F,S,Sum. Preq: Placement into this course determined by The Department of Foreign Languages and Literatures Placement Test: http://oasw.class.ncsu.edu/fl/place.htm.* Content of FLF 101 and 102, at an accelerated pace, for students with previous study of French (1-2 years in high school) who placed into the course based on results of the NC State French Placement Test. Includes a refresher of 101 material beforecovering 102 material. Development of skills in listening, speaking, reading, writing and understanding Francophone cultures. Significant amount of work outside of class. Fulfills the FL 102 requirement.

FLF 201 Intermediate French I. *3(3-0-0) . F,S,Sum. Preq: FLF 102 or FLF 110.* Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussions of French culture, civilization and literature.

FLF 202 Intermediate French II. *3(3-0-0) . F,S,Sum. Preq: FLF 201.* Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of France and the Francophone world.

FLF 212 French: Language, Culture, and Technology. *3(3-0-0) . F. Preq: FLF 102, FLF 110 or two years of high school French.* A study of the language structures and vocabulary necessary for an intermediate level of communication in French together with cultural and technological issues of our global society, in the context of the French-speaking world and the European Union. Students are responsible for providing their own transportation for required field trip.

FLF 301 Survey of French Literature from the Middle Ages through the Enlightenment. *3(3-0-0) . F. Preq: An advanced language skills course (FLF 308, 310, 315) or FLF 202 with permission of instructor.* Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

FLF 302 Survey of French Literature from Romanticism to the Contemporary Period. *3(3-0-0) . S. Preq: An advanced language skills course (FLF 308, 310, 315) or FLF 202 with Consent of Instructor.* Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

FLF 306 French Business Communication. *3(3-0-0) . Alt. yrs.(even). Preq: FLF 202.* Study of major forms of written and oral business communication used in the French-speaking world. Extensive work with current, culturally authentic materials. Emphasis on development of practical communicative skills, with special attention to cross-cultural comparisons of French and American business practices and modes of communication.

FLF 307 Business French. *3(3-0-0) . F. Preq: FLF 202.* Business French vocabulary and concepts with emphasis on cultural differences and their importance in the new global village business world.

FLF 308 Advanced Conversation: Contemporary French Cultures. *3(3-0-0) . S. Preq: FLF 202.* Conversation and reading emphasizing idiomatic and practical usage with attention to contemporary civilization and cultures of the French speaking world. Emphasis on social structures, political features, events, world views and modes of communication.

FLF 309 French Phonetics and Pronunciation. *3(3-0-0) . F. Preq: FLF 202.* A study of the oral production of standard French with the aim of improving pronunciation, fluency and skill in communication. Extensive oral practice through conversation and phonetics.

FLF 310 Advanced Written Communication. *3(3-0-0) . F. Preq: FLF 202.* An in-depth study of French written communication at the advanced level, including the more advanced aspects of the French grammar with extensive writing practice serving a variety of practical communicative needs.

FLF 315 French Civilization and Culture. *3(3-0-0) . S. Preq: FLF 202.* French civilization and culture from its origins to the modern period. Reading and discussion of the social, cultural, economic and political structures of France, including its geography, history, music, art and national consciousness.

FLF 318 The Heritage of French Cinema. *3(3-0-0) . S. Preq: 3 hrs. in French at 300 level.* Survey of the major contributions of French cinema from its origins to the present. Attention to film as an artistic medium and to the cinematic representation of French history and culture. Reading, discussion, and viewing of films including Un Chien Andalou, La Passion de Jeanne d'Arc, Le Retour de Martin Guerre, La Marseillaise, Les 400 Coups, and Diva.

FLF 321 French Cultures and contexts. *3(3-0-0) . S, Alt. yrs.(odd). Preq: FLF 202.* An approach to important periods in the history of French culture through the reading of texts by several important writers. Films, slides, painting, music, and the Internet will be included to put the readings in a cultural context.

FLF 401 French For Graduate Students. *3(3-0-0) .* Basic French grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students' areas of research. Prepares students to take the graduate foreign language certification exam.

FLF 411 Approaches to French Translation. *3(3-0-0) . F, Alt. Yr. (odd). Preq: at least two French (FLF) 300 level courses.* Intensive practice of translating to and from French a variety of texts selected from the areas of business, law, technology and science, as well as literature and the arts. Focus on Documentation, Research and Translation techniques and ethics.

FLF 414 Studies in French Prose. *3(3-0-0) . F,S. Preq: 3 hrs in French at 300 level with 3 hrs in literature.* Major developments in the French essay, letter, novel and other prose forms from the Renaissance to 1900. Readings from such authors as Montaigne, Sevigne, Lafayette, Rousseau, Sand, Balzac, Stendhal, Flaubert.

FLF 425 Literature, Cinema and Culture of the Francophone World. *3(3-0-0) . S. Preq: Graduate standing.* A study of a number of literary texts and films from across the spectrum of the Francophone world - West Africa, the Maghreb, and the Caribbean. Through these texts and films we will study the diversity of the French colonial empire as well as the different historical, political and cultural effects of colonialism and postcolonialism. Films, videos, internet sites will be used.Course taught in French.

FLF 492 Seminar in French Studies. *3(3-0-0) . S. Preq: Junior standing and 6 hrs in French literature.* A small-group study of a topic in literature resulting in either a substantial essay or series of essays by each student. Topics vary each semester.

GERMAN

FLG 101 Elementary German I. *3(3-0-0) . F,S,Sum.* The first in a four-course sequence to develop the language skills of listening, speaking, reading, and writing. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

FLG 102 Elementary German II. *3(3-0-0) . F,S,Sum. Preq: FLG 101.* Second in a four-course sequence to develop the language skills of listening, speaking, reading, and writing. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

FLG 201 Intermediate German I. *3(3-0-0) . F,S,Sum. Preq: FLG 102.* The third of four consecutive courses in German. Intensive conversational practice to develop proficiency in speaking and listening, advanced reading and writing skills by learning complex grammatical structures and through the use of authentic texts. Acquisition of cultural knowledge about the German-speaking countries.

FLG 202 Intermediate German II. *3(3-0-0) . F,S. Preq: FLG 201.* Last of four consecutive courses in German. Continued conversational practice to develop proficiency in speaking and listening. Development of advanced writing skills by refining grammatical structures and style through assignments, and of advancedreading skills through the use of cultural and literary texts from the German-speaking countries.

FLG 208 Intermediate German Conversation. *3(3-0-0) . F,S. Preq: FLG 201.* Intensive practice in speaking and understanding German through role playing, debates, interviews and use of audio-visual materials.

FLG 212 German Language, Culture, Science, and Technology. *3(3-0-0) . F. Preq: FLG 102.* The third consecutive courses in German, with a special focus on the language of technology and the topics of science, technology, and society in the German-speaking countries. Intensive conversational practice to develop proficiency in speaking and listening, advanced reading and writing skills by learning complex grammatical structures and through the use of authentic texts. Acquisition of general cultural knowledge and of selected issues of science and technology in the German-speaking countries.

FLG 300 Introduction to German Literature. *3(3-0-0) . F. Preq: FLG 202.* An introduction to reading and analyzing German, Austrian, and Swiss literary texts in their cultural and historical contexts. Discussion of various genres (short story, novel, drama, poetry) formal aspects, literary periods, and a variety of critical approaches. Lectures and much discussion. Oral and written assignments, exam.

FLG 307 Business German. *3(3-0-0) . F, Alt. yrs. Preq: FLG 202.* Business German vocabulary and terminology. Readings and discussions on current business topics. Special consideration to intercultural communication relative to international business operations.

FLG 309 Advanced German Conversation. *3(3-0-0) . F. Preq: FLG 202.* Intensive conversational practice in class based on current topics. Discussions

about the cultures and civilizations of the German-speaking countries. Attention to cultural factors essential to effective communication. Oral reports by students.

FLG 310 Advanced German Syntax and Composition. *3(3-0-0) . Preq: FLG 202.* Advanced aspects of German syntax and writing styles. Assignments include paraphrasing and summarizing authentic German texts and writing compositions.

FLG 311 Introduction to German Translation. *3(3-0-0) . F, Alt yrs. Preq: FLG 202.* Introduction to theory, methods, and techniques in translation applied to materials of various fields and professions. Emphasis on written translation.

FLG 315 Germanic Civilization and Culture. *3(3-0-0) . Preq: FLG 202.* Culture and civilization of the German-speaking countries. Analysis of the social, economic and political structures of Germany, Austria, and Switzerland. Lectures, reports, conversation. Taught in German.

FLG 316 German Lyric Poetry. *3(3-0-0) . S. Preq: FLG 202.* A historical and interpretative study of the German lyric from the fifteenth into the twentieth century with special attention to the poet's choice of theme, the ways in which that theme is treated, and the relevance of the poem to the human experience.

FLG 318 New German Cinema. *3(3-0-0) . S. Preq: FLG 202.* Survey of the major contributions to the $New German Cinema$ (1970's to 1990's). Attention to film as an artistic medium and to the cinematic representation of German history and culture. Reading, discussion, and viewing of films including films by Schloendorff (Die Blechtrommel), Fassbinder (Die Ehe der Maria Braun), von Trotta (Rosa Luxemburg), Herzog (Stroszek), and Wenders (Der Himmel ueber Berlin).

FLG 323 Twentieth Century German Literature. *3(3-0-0) . Preq: FLG 202.* Twentieth century literature from German-speaking countries. Readings of Mann, Kafka, Rilke, Hesse, Durrenmatt, Frisch, Grass, and a variety of poets.

FLG 390 German Studies Topics. *3(3-0-0) . Preq: FLG 202.* Presentation of material not available in regular course offerings, or offering of new courses on a trial basis. Course may be offered through videoconferencing with other UNC campuses as an offering of the German Studies Consortium. Content determined by faculty member in consultation with the department's German section coordinator. May be repeated.

FLG 398 Independent Study in German. *1-6. F,S,Sum. Preq: FLG 202.* Individualized study in German language, culture, or literature. Topic, mode of study, and credit hours to be determined in consultation with the faculty member supervising work. Departmental approval required.

FLG 401 German For Graduate Students. *3(3-0-0) . F.* Basic German grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students' areas of research. Prepares students to take the graduate foreign language certification exam.

FLG 407 Business German II. *3(3-0-0) . S.(ALTYRODD). Preq: FLG 307.* Second course in the two-course series on Business German. Topics cover project planning, international marketing, trade fair presentation, financial issues, work place issues, logistics, including all forms of oral and written communication in these areas. Brief lectures, much discussion, oral presentations, written assignments, exam. Course can be used as preparation for certification in the internationally recognized $Zertifikat Deutsch fur den Beruf$ (certificate $German for Professionals$). Certification is voluntary, for a fee, and separate from the course.

FLG 420 Current Issues in German-Language Media. *3(3-0-0) . F. Preq: Two courses at the FLG 300 level.* Using the internet and a textbook, the course will be constructed from current topics circulated in the German, Austrian and Swiss media, e.g. newspaper websites, radio programs and TV news in streaming video format. Overview of the different news genres, the German-language media scape, and major political, economic, social and cultural issues in the German-speaking countries. Discussion, oral presentations, written assignments.

FLG 430 Cultural Artifacts in the German-Speaking Countries. *3(3-0-0) . F, (ALTYRODD). Preq: One FLG 300-level course and one from this list: FLG 300, 315, 316, 318, 323, 390..* Focuse on major cultural achievements in Germany, Austria and Switzerland, including literature, film, art, and music. Topics will vary. Examples are: $Kafka and Modernism$, $German/Austrian/Swiss Literature and Film-Adaptations$, $German-LanguageOpera$, $German Art and Society in the 20th Century$, or $The Faust Theme in Literature, Art, and Music$.

HEBREW

FLH (REL) 101 Elementary Biblical Hebrew I. *3(3-0-0) . F,S.* The elements of grammar and syntax essential for a reading knowledge of Biblical Hebrew. Reading is drawn primarily from the Book of Genesis and some attention given to exegetical method.

FLH (REL) 102 Elementary Biblical Hebrew II. *3(3-0-0) . F,S. Preq: REL (FLH) 101.* A continuation of REL (FLH) 101 with increased emphasis upon reading selected prose passages.

FLH (REL) 201 Intermediate Biblical Hebrew I. *3(3-0-0) . F,S. Preq: REL (FLH) 102.* Continuing development of vocabulary and understanding of grammar and syntax through reading of selected prose and poetic passages in the Hebrew Bible. Exegetical matters are considered.

FLH (REL) 202 Intermediate Biblical Hebrew II. *3(3-0-0) . F,S. Preq: REL (FLH) 201.* Exclusive attention devoted to reading and interpreting selected prose and poetic passages in the Hebrew Bible.

ITALIAN

FLI 101 Elementary Italian I. *3(3-0-0) . F.* Begins the development of a balanced foundation in all four language skills. Concentrates on listening and speaking, emphasizing idiomatic Italian. Short readings in Italian culture and civilization. Class and laboratory practice, written homework.

FLI 102 Elementary Italian II. *3(3-0-0) . Preq: FLI 101.* Continuation of FLI 101 with emphasis on acquisition of oral skills through class practice and use of audio aids. Readings in Italian culture, civilization and literature.

FLI 201 Intermediate Italian I. *3(3-0-0) . Preq: FLI 102.* Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussion of Italian culture, civilization and literature.

FLI 202 Intermediate Italian II. *3(3-0-0) . Preq: FLI 201.* Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of Italy.

FLI 208 Intermediate Italian Conversation. *3(3-0-0) . Coreq: FLI 201.* Intensive practice in speaking and understanding Italian through role playing, discussion, interviews, and use of audio-visual materials.

FLI 308 Italian Reading and Conversation. *3(3-0-0) . Preq: FLI 201.* Advanced readings and intensive conversational practice in Italian for students beyond the intermediate level.

JAPANESE

FLJ 101 Elementary Japanese I. *3(3-0-0) . F. Coreq: FLJ 103.* Introduction to standard, formal Japanese. Emphasis on speaking and listening skills. Exposure to Japanese culture, reading, and writing.

FLJ 102 Elementary Japanese II. *3(3-0-0) . S. Preq: FLJ 101. Coreq: FLJ 104.* Continuation of basic skills. Emphasis on speaking and listening skills; inclusion of Japanese cultural factors in communication. Some reading and writing.

FLJ 103 Elementary Japanese I Conversation. *1(1-0-0) . F. Coreq: FLJ 101.* Supplements conversational practice in FLJ 101. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to correcting and improving pronunciation and intonation.

FLJ 104 Elementary Japanese II Conversation. *1(1-0-0) . S. Preq: FLJ 101. Coreq: FLJ 102.* Supplements conversational practice in FLJ 102. Extensive use of speaking skills in a variety of situations. Special attention given to correcting and improving pronunciation and intonation.

FLJ 105 Intensive Elementary Japanese. *6(6-0-0) .* An intensive introduction to standard, formal Japanese. Emphasis is on speaking and listening skills. Some reading and writing. Combines FLJ 101 and 102.

FLJ 201 Intermediate Japanese I. *3(3-0-0) . F. Preq: FLJ 102 or FLJ 105. Coreq: FLJ 203.* Continuation of basic skills. Greater emphasis on reading and writing. More exposure to Japanese cultural traditions.

FLJ 202 Intermediate Japanese II. *3(3-0-0) . Preq: FLJ 201. Coreq: FLJ 204.* Continuation of the learning of the basic skills. Emphasis on reading and writing as well as on spoken Japanese and on cultural patterns of behavior.

FLJ 203 Intermediate Japanese Conversation. *1(1-0-0) . F,S. Preq: FLJ 102. Coreq: FLJ 201, FLJ 202 or FLJ 301.* Practice in spoken Japanese through use of the language in a variety of situations. Increase vocabulary and develop fluency and ease in the structural patterns of the language.May be repeated for a maximum of three credit hours.

FLJ 204 Intermediate Japanese II Conversation. *1(1-0-0) . S. Coreq: FLJ 202.* Supplemental intermediate conversational practice. Drills and situational exercises to build oral proficiency with patterns introduced in FLJ 202.

FLJ 301 Intermediate Japanese III. *3(3-0-0) . F. Preq: FLJ 202.* Continued study of Japanese language. Primary emphasis on spoken Japanese, but attention also given to reading, writing and culture.

FLJ 302 Intermediate Japanese IV. *3(3-0-0) . S. Preq: FLJ 301.* Continued training in the foundations of Japanese language. Primary emphasis on spoken Japanese, with increased attention to reading and writing.

FLJ 401 Advanced Japanese I. *3(3-0-0) . F. Preq: FLJ 302.* Continued training in the foundations of Japanese language, with emphasis on complex verb forms. Increased attention to reading and writing.

FLJ 402 Advanced Japanese II. *3(3-0-0) . S. Preq: FLJ 401.* Elaboration on grammatical forms learned in the previous courses with applications in reading and writing, combined with more sophisticated vocabulary and idioms and attention to development of natural reading skills.

SWAHILI

FLK 101 Elementary Swahili I. *3(3-0-0) . F, Alt yrs.* First in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilization.

FLK 102 Elementary Swahili II. *3(3-0-0) . S, Alt yrs. Preq: FLK 101.* Second in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilization.

FLK 201 Intermediate Swahili I. *3(3-0-0) . F, Alt yrs. Preq: FLK 102.* Third in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilizations.

FLK 202 Intermediate Swahili II. *3(3-0-0) . Preq: FLK 201.* Fourth in a four-course sequence to develop language skills in Swahili (Kiswahili). Oral and written practice. Readings in African culture and civilization.

HINDI

FLN 101 Elementary Hindi-Urdu I. *3(3-0-0) . F. Coreq: FLN 103.* Introduction to standard Hini-Urdu. Emphasis on speaking and listening, and on reading and writing in the Hindi writing system (Devanagari). Readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 101 at the University of North Carolina-Chapel Hill.

FLN 102 Elementary Hindi-Urdu II. *3(3-0-0) . S. Preq: FLN 101. Coreq: FLN 104.* Continuation of FLN 101. Emphasis on oral communication and reading and writing in the Hindi writing system (Devanagari). Further readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 102 at the University of North Carolina-Chapel Hill.

FLN 103 Elementary Hindi-Urdu I Conversation. *1(1-0-0) . F. Coreq: FLN 101.* Required conversational practice for FLN 101. Special attention to individual pronunciation and intonation. Introduction of formal and informal speech. Use of audiovisual materials.

FLN 104 Elementary Hindi-Urdu II Conversation. *1(1-0-0) . S. Preq: FLN 101. Coreq: FLN 102.* Required conversational practice for FLN 102. Extensive use of speaking skills in variety of situations. Attention to supplemental non-verbal communication. Use of audiovisual materials.

FLN 201 Intermediate Hindi-Urdu I. *3(3-0-0) . F. Preq: FLN 102. Coreq: FLN 203.* Continuation of basic language skills. Introduction of Urdu writing system (Nastaliq) through Hindi writing system (Devanagari). Introduction to grammatical divergence of Hindi and Urdu. Readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 103 at the University of North Carolina-Chapel Hill.

FLN 202 Intermediate Hindi-Urdu II. *3(3-0-0) . S. Preq: FLN 201. Coreq: FLN 204.* Continuation of FLN 201. Further practice of both Urdu (Nastiliq) and Hindi (Devanagari) writing systems. Further distinction of spoken and literary Urdu and Hindi. Further readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 103 at the University of North Carolina-Chapel Hill.

FLN 203 Intermediate Hindi-Urdu I Conversation. *1(1-0-0) . F. Preq: FLN 102. Coreq: FLN 201.* Required conversational practice for FLN 201. Advancement of speaking skills through role playing, interviews, debates. Further Hindi and Urdu non-verbal communication. Use of audiovisual materials, including responses to commercial television and movies.

FLN 204 Intermediate Hindi-Urdu II Conversation. *1(1-0-0) . S. Preq: FLN 201. Coreq: FLN 202.* Required conversational practice for FLN 202. Refinement of speaking skills through role playing, interviews, debates. Further Hindi and Urdu non-verbal communication. Use of audiovisual materials, including responses to commercial television andmovies.

FLN 208 Intermediate Hindi Conversation. *3(3-0-0) . F. Preq: FLN 201.* Intensive practice in speaking and understanding Hindi through role playing, debates, interviews, and use of audio-visual materials.

FLN 301 Advanced Hindi: Readings in Literature I. *3(3-0-0) . F. Preq: FLN 202.* Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background. Taught through interactive TeleVideo.

FLN 302 Advanced Hindi: Readings in Literature II. *3(3-0-0) . S. Preq: FLN 301.* Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background. Taught through interactive TeleVideo.

FLN 308 Advanced Hindi Conversation. *3(3-0-0) . S. Preq: FLN 208.* Conversation and reading emphasizing idiomatic and practical usage with attention to contemporary civilization and cultures of the Hindi speaking world. Emphasis on social structures, political features, events, world views and modes of communication.

PORTUGUESE

FLP 101 Elementary Portuguese I. *3(3-0-0) .* Introduction to the fundamentals of Brazilian Portuguese: pronunciation, comprehension, and spoken syntax and grammar.

FLP 102 Elementary Portuguese II. *3(3-0-0) . Preq: FLP 101.* Continuation of the essentials of Brazilian Portuguese. Further stress on pronunciation and comprehension and introduction of reading and writing skills.

FLP 201 Intermediate Portuguese I. *3(3-0-0) . F. Preq: FLP 102 or placement in course.* The third level of Portuguese with special attention to speaking, reading, writing and developing a cultural awareness of the cultural heritage of the Portuguese-speaking peoples of Portugal, Brazil and Portuguese-speaking Africa.

RUSSIAN

FLR 101 Elementary Russian I. *3(3-0-0) . F.* First in a four-course sequence to develop language skills in Russian. Oral and written practice in the classroom and language laboratory and attention to Russian cultural heritage.

FLR 102 Elementary Russian II. *3(3-0-0) . S. Preq: FLR 101.* Emphasis on acquisition of basic oral skills, with complementary reading and writing exercises and attention to Russian cultural heritage.

FLR 201 Intermediate Russian I. *3(3-0-0) . F. Preq: FLR 102.* Basic Russian language skills continued. More emphasis given to writing and essential conversational practice. Intermediate level readings in Russian literature and culture. Class and laboratory practice; written assignments.

FLR 202 Intermediate Russian II. *3(3-0-0) . S. Preq: FLR 201.* Advanced aspects of Russian syntax through study of text. Continued attention to conversational practice and vocabulary building.

FLR 303 Russian Literature in Translation: The Nineteenth Century. *3(3-0-0) . S, Alt. yrs.* A study of selected plays, short stories and novels of the great Russian writers of the nineteenth century: Pushkin, Lermontov, Gogol, Goncharov, Turgenev, Dostoevsky, Saltykov-Shchedrin, Leskov, Tolstoy and Chekhov. Examinations of peculiarly Russian as well as the universal aspects of this literature. All readings, lectures and discussions in English.

FLR 304 Russian Literature in Translation: The Twentieth Century. *3(3-0-0) . S, Alt yrs.* A study of selected poems, plays, short stories and novels by major Russian writers of the twentieth century, such as Chekhov, Gorky, Blok, Mayakovsky, Esenin, Zamyatin, Olesha, Bulgakov, Babel, Pilnyak, Pasternak, Solzhenitsyn, Evtushenko, and Voznesensky. All readings, lectures and discussions in English.

SPANISH

FLS 101 Elementary Spanish I. *3(3-0-0) .* Listening and speaking; development of a balanced foundation in all Spanish languages skills. Idiomatic, everyday Spanish and cultural awareness. Class practice, laboratory and written homework.

FLS 102 Elementary Spanish II. *3(3-0-0) . Preq: FLS 101.* Use of Spanish through past tenses, regular and irregular, and various morphological and syntactical aspects. Emphasis on oral skills and increased cultural awareness. Written work and laboratory practice assigned daily.

FLS 105 Intensive Elementary Spanish. *6(6-0-0) .* An intensive course aimed at developing a balanced foundation in listening, speaking, reading, and writing Spanish. Equivalent to FLS 101 plus FLS 102.

FLS 110 Accelerated Elementary Spanish. *3(3-0-0) . F,S,Sum. Preq: A score of 14-24 on the Spanish placement exam is required for matriculation in this course.* Contents of FLS 101 and FLS 102 at an accelerated pace, for students placed into the course based on results of the Spanish placement test, or those with prior knowledge of another Romance language. Significant amount of work outside of class. Development of a balanced foundation in listening, speaking, reading, and writing Spanish, and understanding Hispanic cultures.

FLS 201 Intermediate Spanish I. *3(3-0-0) . F,S,Sum. Preq: FLS 102,105 or 110.* The third of four consecutive Spanish courses idiomatic, spoken Spanish. With special attention to reading and writing skills and the cultural heritage of the Spanish-speaking peoples. Class practice, laboratory and written assignments.

FLS 202 Intermediate Spanish II. *3(3-0-0) . F,S,Sum. Preq: FLS 201.* Last of four sequential courses in the foundations of the Spanish language. Attention to writing skills and cultural heritage of Spanish-speaking peoples.

FLS 208 Intermediate Spanish Conversation. *3(3-0-0) . F,S. Coreq: FLS 201.* Intensive practice in speaking and understanding Spanish through role playing, discussion, interviews and use of audio-visual materials.

FLS 210 Accelerated Intermediate Spanish. *3(3-0-0) . F,S,Sum. Preq: A score of 25-30 on the Spanish placement exam is required for matriculation in this course.* Content of FLS 102 and FLS 201 at an accelerated pace, for students placed into the course based on results of the Spanish placement test, or those with significant knowledge/experience with another Romance language. Substantial amount of work outside of class. Development of a balanced foundation in listening, speaking, reading, and writing Spanish, and understanding Hispanic cultures.

FLS 212 Spanish: Language, Technology, Culture. *3(3-0-0) . F,S. Preq: FLS 102 or 2 yrs high school Spanish.* A study of the language structures and vocabulary necessary for an intermediate level of communication in Spanish together with cultural and technical issues of our global society in the context of the Spanish-speaking world. Fulfills either the FL 201 requirement or the STS-H&SS requirement, but not both

FLS 300 Introduction to Hispanic Literatures. *3(3-0-0) . F,S. Preq: FLS 310 or FLS 311.* An introduction to the major literary genres and movements in Spanish and Latin American literatures. Lectures, discussions, films and written assignments.

FLS 301 Survey of Spanish Literature Through The Golden Age. *3(3-0-0) . F. Preq: 6 hours at the 300 level. FLS 310 (Advanced Spanish Grammar) or 311 (Spanish composition) is required; FLS 300 (Introduction to Hispanic Literatures) is recommended.* Literature of Spain from the Middle Ages to the beginning of the eighteenth century.

FLS 302 Survey of Spanish Literature: 1700 to Present. *3(3-0-0) . S. Preq: 6 hours at the 300 level. FLS 310 (Advanced Spanish Grammar) or 311 (Spanish Composition) is required; FLS 300 (Introduction to Hispanic Literatures) is recommended.* Introduction to Spanish Neoclassicism, Romanticism, Realism, and twentieth-century literature. Special attention to the quest for new values in contemporary literature.

FLS 303 Latin American Literature to 1898. *3(3-0-0) . F. Preq: 6 hours at the 300 level. FLS 310 (Advanced Spanish Grammar) or 311 (Spanish Composition) is required; FLS 300 (Introduction to Hispanic Literatures) is recommended.* Latin American literature beginning with the Chronicles and extending through the Colonial Period and the literature of independence.

FLS 304 Latin American Literature from 1898 to the Present. *3(3-0-0) . F,Sum, Preq: 6 hours at the 300 level. FLS 310 (Advanced Spanish Grammar) or 311 (Spanish Composition) is required; FLS 300 (Introduction to Hispanic Literatures) is recommended.* Latin-American literature beginning with the Modernista authors, including Regionalist and Avantgarddiste authors, and extending to contemporary works.

FLS 306 Business Correspondence in Hispanic Culture. *3(3-0-0) . F,S. Preq: FLS 208 or FLS 308.* Presentation of business correspondence and cultural aspects through a variety of business letters based on existing models, and according to specific business transactions. Topics relevant to historical, geographical, and linguistic elements of multiple Spanish-speaking countries.

FLS 307 Business Spanish. *3(3-0-0) . Preq: FLS 310 or FLS 311.* Business Spanish vocabulary and terminology. Emphasis on everyday spoken and written Spanish. Readings and discussions of business topics. Cross-cultural considerations relative to international business operations.

FLS 308 Spanish Conversation and Reading. *3(3-0-0) . Preq: FLS 202.* Intensive practice in speaking and reading Spanish. Drills and conversation with emphasis on practical language and idiomatic expressions.

FLS 309 Spanish Phonetics and Advanced Conversation. *3(3-0-0) . Preq: FLS 202.* A study of the production of the sounds of Standard Spanish with the aim of improving pronunciation, fluency, and skill in communication. Extensive oral practice in phonetics and conversation.

FLS 310 Advanced Spanish Grammar. *3(3-0-0) . F, S. Preq: FLS 202.* Review of advanced aspects of Spanish grammar, with extensive practice through a variety of contextualized exercises, analyses of readings and original compositions. Topics relevant to Hispanic culture and civilization in lectures, discussions, exercises and compositions. Emphasis on all language skills.

FLS 311 Advanced Spanish Composition. *3(3-0-0) . Preq: FLS 202.* An intensive course in the theory and practice of Spanish composition with lectures, discussions and weekly writing assignments.

FLS 315 Culture and Civilization of the Iberian Peninsula. *3(3-0-0) . F. Preq: FLS 310 or FLS 311.* The Iberian Peninsula as a crossroads of civilizations from neolithic times to the present. The emergence of Spain and Portugal as nations, the rise and fall of their overseas empires, and their contemporary civilizations.

FLS 316 The Culture and Civilization of Latin America. *3(3-0-0) . S. Preq: FLS 310 or FLS 311.* Survey of the cultural traditions of Latin America including Brazil. The major pre-Columbian civilizations, Spanish and Portuguese colonialism, the emergence of the modern nations. Films and recordings supplement readings and discussions.

FLS 318 Hispanic Cinema. *3(3-0-0) . Preq: 6 hrs Spanish at 300-level.* Survey of the major contributions of Hispanic cinema from its origins to the present. Analysis of film as an artistic medium and as the cinematic representation of Hispanic histories and cultures. Reading, discussions, and viewing of films by representative directors.

FLS 319 Children's and Adolescent's Literature in Spain and Latin America. *3(3-0-0) . Preq: FLS 310 or FLS 311.* Traditional and contemporary children's and adolescent's literature written originally in Spanish. Critical examination of picture books, folktales, poetry, theater and novels from a literary/artistic point of view and for their value in cultural development.

FLS 323 Contemporary Hispanic Literature. *3(3-0-0) . Preq: FLS 202; Recommended FLS 301,302,303 and /or FLS 304.* Selected works of Hispanic fiction, essays and /or poetry of the twentieth century. The periods may include the generations of 1898 and 1927 and the post-Civil War writers in Spain; modernismo, the $Boom$, the $post-Boom$, testimonial literature, contemporary poetry in Latin America, women writers.

FLS 400 Methods and Techniques in Spanish Translation and Interpretation. *3(3-0-0) . Preq: FLS 310 or FLS 311.* Study and practical application of theory, methods and techniques of translation based on materials relevant to various fields and professions.

FLS 401 Spanish For Graduate Students. *3(3-0-0) . F,S.* Basic Spanish grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students' areas of research. Prepares students to take the graduate foreign language certification exam.

FLS 402 Linguistic Structure of Spanish. *3(3-0-0) . F,S. Preq: FLS 208 or 308; FLS 310 or 311.* Introduction to fundamental terminology and concepts in the study of linguistics. Overview of the Spanish sound system (phonology), principles of word formation such as derivation and inflection (morphology), structure and grammatical relations of phrases and sentences (syntax), as well as the relationship between linguistic levels.

FLS 403 Hispanic Prose Fiction. *3(3-0-0) . Preq: 3 hours in literature at the 300 level (Either FLS 301, 302, 303 or 304).* Nineteenth- and twentieth-century prose and fiction of Spain and Latin America, including Galdos, Realism, the Boom, testimonial literature.

FLS 404 Hispanic Drama. *3(3-0-0) . Preq: 3 hours in literature at the 300 level (Either FLS 301, 302, 303 or 304).* Selected topics in Spanish of Latin-American drama from the Golden Age to the present.

FLS 492 Seminar in Hispanic Studies. *3(3-0-0) . S. Preq: Junior standing and Departmental approval required.* Advanced seminar on a specific area of Hispanic studies (topics vary), leading to a major term paper and/or a series of essays by the student.

FORESTRY

FOR 110 Introduction to Forestry. *2(1-3-0) . F.* Overview of the history and policies of forestry, the basis of forest management, the impact of forestry on nature and society, and the opportunities of a career in forestry.

FOR 150 Professional Development I: Critical Thinking in Natural Resources. *1(1-0-0) . S.* Techniques of critical thinking applied to a broad range of natural resource and forestry issues.

FOR 172 Forest System Mapping and Mensuration I. *2(1-3-0) . F.* Concepts and application of basic forest and land resource measurement techniques used in forestry and related fields. Measuring distances and areas; orienteering; basic air photo and topographic map interpretation; introduction to GPS; measuring tree characteristics; introduction to forest sampling. Application of spreadsheets and word processing to analyze and summarize resource characteristics. Field trip required.

FOR (WPS) 202 Wood Anatomy and Properties. *3(2-3-0) . F.* Formation, anatomy and properties of wood. Structural features of softwoods and hardwoods and the relationships among anatomy, physiology, physical and mechanical properties. Variability, naturally occurring defects, and wood deterioration are discussed and related to wood utilization. Techniques on hand lens and microscopic identification of wood.

FOR 204 Silviculture. *2(0-6-0) . Sum. Preq: Summer camp eligibility.* Silvical characteristics and growth requirements of forest trees; dynamics of stand growth, species-site relationships, site productivity, forest pest interactions, hydrology and nutrient cycling in forest ecosystems; emphasis on understanding and applying ecological principles to the production of multiple benefits at the forest community level.

FOR 212 Dendrology. *4(2-4-0) . F.* Identification and elementary silvics of woody plants of eastern North America with studies of their classification, characteristics, and habitats. Consideration of trees from northern and western North America and the Caribbean region. Field identification with trips to forest communities.

FOR 220 Urban and Community Forestry. *3(3-0-0) . F.* Introduction to the interdisciplinary study of urban forestry and greenspaces. Study of urban forest history, distribution and ownership patterns, urban ecology and ecosystems, benefits and uses of urban forests, vegetation establishment and maintenance, urban planning and policy, community interactions, urban forestry implementation.

FOR (FW, ZO) 221 Conservation of Natural Resources. *3(3-0-0) .* Importance of natural resources and their role in human environment. Physical, biological and ecological principles underlying sustainability of natural resources with attention to consequences of human impacts while meeting society needs.

FOR 248 Forest History, Technology and Society. *3(3-0-0) . F,S.* Examining forest resource use and issues throughout history. Tracing developments and concepts that created the context for today's issues concerning global forest resources. Examining how wood resource availability shaped civilization's development, and examining consequences on forest resources of civilization's scientific, social, and technological progress.

FOR 250 Professional Development II: Communications in Natural Resources. *1(1-0-0) . S.* Development of written and oral communication skills for forestry and natural resources management. Discussion topics include interactive communication, writing to a target audience, common pitfalls in technical writing, various kinds of technical writing, poster and oral presentations, reviewing and revising writing, and responding to questions in a professional manner.

FOR 252 Introduction to Forest Science. *3(2-3-0) . S.* Integration of biological principles into studies of tree growth, reproduction, establishment, survival, and disturbance. Discussions of regional silviculture and of effects of humans on forest ecosystems. Instruction in forest sampling and tree identification. Many laboratories meet outdoors.Not open to Forest Management majors.

FOR 260 Forest Ecology. *3(2-3-0) . S.* Introduction to forest ecosystems, their structure, and the processes that regulate them including: radiation, temperature, water, and biogeochemistry; productivity; plant populations; structure and function of forest communities; succession; wind and fire; and human influences.

FOR 261 Forest Communities. *2(0-6-0) . Sum. Preq: FOR 212 or BO 220 or BO 403.* Study of the species composition, distribution, site requirements, and succession of the principal forest communities of southeastern North America. Identification of important member plant species. Field trips to typical examples.

FOR 264 Forest Wildlife. *1(0-3-0) . Sum. Preq: Summer camp eligibility.* Diversity of fauna that inhabits forest communities in the Piedmont of North Carolina. Inventory terrestrial and aquatic habitats and identify various vertebrate and invertebrate species. Insect collection initiated. The life histories of representative species presented.

FOR 265 Fire Management. *1(0-3-0) . Sum. Preq: Summer camp eligibility.* Effects of wildfire and prescribed fire on forest ecosystem components and processes; fire behavior and the ecosystem and meterologic factors that affect it; silvicultural uses of fire; organization, equipment, and tactics for wildfire suppression; fire suppression exercises on the North Carolina Division of Forest Resources' Forest Fire Simulator.

FOR 273 Forest System Mapping and Mensuration II. *3(1-6-0) . Sum. Preq: FOR 172.* Procedures and Instruments for measuring various tree and stand characteristics. Determination of stem volume and taper. Planning and implementation of forest resource samples to provide population estimates using fixed-radius and variable-radius sampling. Detailed coverage of land measurements and mapping of boundary surveys. Use of aerial photography, topographic maps, and GPS to aid in resource assessment. Incorporation of inventory data into a GIS. Basic statistical concepts applied to resource measurements. Taught off-campus at Hill Forest.

FOR 280 Evolution of Forest machinery and Systems. *3(3-0-0) . F.* Introduction to forest resources operations and machinery. Historical account of the volution of mechanized forest operations: harvesting, inwood transport, processing, hauling, site preparation, planting, forest land maintenance, nursery and seed orchard machines. Discussion of current and future machines for forest harvest and regeneration.

FOR 291 Independent Study in Forestry. *1-6. F,S,Sum.* Detailed investigation of forestry topics of interest to undergraduates under faculty direction on a tutorial basis. Credit and content determined by faculty member in consultation with Undergraduate Program Director or Department Head.

FOR 295 Special Topics in Forestry. *1-6. F,S,Sum.* Study of forestry topics not covered in existing courses at the introductory level. Development of a new course on a trial basis.

FOR 303 Silvics and Forest Tree Physiology. *3(3-0-0) . F. Preq: BIO 125, CH 201, PY 211, BO 360, SSC 200 & summer camp. Coreq: FOR 353, FOR 319, FW 353, ST 311.* Ecological and physiological processes influencing establishment, growth, and development of forest stands with particular emphasis on forest types of Southeastern United States; influence of resource availability on forest stand productivity; physical and biochemical processes associated with tree function, including water relations, mineral nutrition, transport and translocation, photosynthesis, respiration; internal and environmental factors regulating tree growth and development.

FOR 304 Theory of Silviculture. *4(3-3-0) . S. Preq: FOR 303,353,319, FW 353, ST 311. Coreq: FOR 374,434, ENT 402, PP 318.* Ecological processes affecting the establishment and growth of forest stands with particular emphasis on forest types of the Southeastern United States. Forest stand productivity, how productivity is influenced by site, stand, climatic factors, and the application of site specific prescriptions to establish and manipulate the composition, growth, and health of forest stands.

FOR (PP) 318 Forest Pathology. *3(2-2-0) . S. Preq: BIO 125 or BO 200.* Major diseases of forest trees and deterioration of wood products emphasizing principles of plant pathology; diagnosis; nature, physiology, ecology, and dissemination of disease-causing agents; mechanisms of pathogenesis; epidemiology and environmental influences; principles and practices of control.

FOR 319 Forestry Economics. *4(3-2-0) . F. Preq: ARE 201 or EC 205.* Concepts and techniques for analyzing the utilization of forest resources. Topics include: long-term economic-ecologic assessments of forested landscapes, economic and biological concepts of sustainability, characteristics of forest product marketsand implications for harvest prices and inventory across the landscape and over time, bio-economic analysis of timber investments and financial comparisons to alternatives, and introduction to large-scale harvest scheduling problems with temporal and spatial constraints using linear-programming.

FOR 330 North Carolina Forests. *3(3-0-0) . F,S.* An introduction and overview of forests in North Carolina with emphasis on the importance of forests in the 21st century. Topics include: history and distribution of forests, soils-sit relationships, forestry practices, non-conventional management objectives. Two required Saturday field trips.

FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management. *1(1-0-0) . S. Preq: Junior standing.* Study of ethical issues confronting natural resource management professionals, including: biodiversity conservation, private property rights, traditional religion and ecological values, community rights, environmental racism, hunting and animal rights, business ethics, and the purpose and content of professional codes of ethics.

FOR 353 Air Photo Interpretation and Photogrammetry. *3(2-3-0) . F. Preq: MA 114.* Theory, principles, and techniques of utilizing air photos for inventory and management of renewable resources, photogrammetric and engineering applications, hydrologic and terrain analysis, and land use/cover mapping. Introduction to remote sensing and use of color infrared, thermal, Skylab, and Lands at imagery in resource mapping.

FOR 374 Forest Measurement, Modeling, and Inventory. *3(2-2-0) . S. Preq: MA 121 and 114; or 242; CNR 134, FOR 274, ST 311.* Mathematical functions required for quantifying the yield of timber and non-timber products. Procedures for planning, conducting, and analyzing forest inventories. Use of mathematical models to estimate growth and yield of forest stands and non-timber products for management decisions.

FOR (ENT) 402 Forest Entomology. *3(2-2-0) . S. Preq: Junior standing and BIO 125.* Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.

FOR (FW) 404 Forest Wildlife Management. *3(3-0-0) . S. Preq: 9 hrs Biological Sciences.* Relationships between forest and wildlife management and the effects of silvicultural systems on wildlife. Species-habitat requirements, forest wildlife management techniques, and forest-wildlife policies and economics. (See Fisheries and Wildlife Sciences.)

FOR 405 Forest Management. *4(2-4-0) . F. Preq: FOR 304 and FOR 374.* Fundamental principles and analytical techniques necessary in the planning, management and optimization of forest operations. Formulation of objectives and constraints, yield forecasting, forest regulation, procurement and marketing, inventory methods, and management plan preparation. Written and oral reporting.

FOR 406 Forest Inventory, Analysis and Planning. *4(0-16-0) . S. Preq: FOR 405, FOR 460.* Independent project in designing and implementing a multi-resource survey; analyze stand conditions; forecast growth, yield and revenue of timber and forest products; use linear programming to prepare a long-term management plan subject to economic,social, and ecological constraints; assess economic and environmental impacts of potential actions; and report results orally and in writing.

FOR 411 Forest Tree Genetics and Biology. *3(3-0-0) . S. Preq: Junior standing or Senior standing with a biological background.* Genetics as it is applied in forest management for both conifers and hardwoods. The variation, evolution and genetics of forest trees. Methods for selection, breeding, seed production, and vegetative propagation. Exotics, wood properties, and tree improvement as a forest management tool.

FOR 414 World Forestry. *3(3-0-0) . S.* Management of global forest resources; distribution and trends in forest cover; role of forests in economic development; international production and trade of forest products; current policy issues, including tropical deforestation, certification, and carbon sequestration; social forestry and non-timber forest products; international institutions and aid for conservation and development; identification and evaluation of sources of current information on global forestry issues.

FOR 415 World Forestry Study Tour. *1(1-0-0) . S. Coreq: FOR 414.* Field trip to Mexico and/or Central America for seven days over spring break. Examine tropical forestry issues through field visits to timber concessions, plantations, nurseries, wood products firms, protected areas, and agroforestry projects; meetings with representatives of forest research institutes, government agencies, timber industry, cooperatives, and environmental organizations; and interaction with local people. Fee for field trip determined annually.Offered during spring break, as aone week field trip to Mexico and/or Central America.

FOR (NR) 420 Watershed and Wetlands Hydrology. *4(3-3-0) . F. Preq: SSC 200, BO 360.* Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required.Credit will not be given for both FOR(NR)420 and FOR(NR)520.

FOR 422 Consulting Forestry. *3(2-2-0) . F. Preq: Senior standing in Forest Management.* Forest land acquisition and ownership: ownership, appraisal, legal considerations, financial management and planning. Producing forest resources: timber, wildlife, recreation, farm products, water, minerals, specialty products, and development. Marketing forest resources: timber, recreation, farm leases, minerals, specialty products, and developed property. Forest resources consulting: forms of organization, pricing of services, consultant client relationships (Law of Agency), professional ethics and continuing education.

FOR (WPS) 423 Forest Machinery and Systems. *3(2-3-0) . F. Preq: Junior standing in FOM, BE, WP.* Applications of engineering principles to problems in forest operations: power sources; testing; rating and capabilities of forest machinery; power requirements and utilization efficiencies; effects of vehicle design parameters on stability, safety, and operation under load; traction devices and vehicle mechanics.

FOR 434 Forest Operations and Analysis. *3(2-3-0) . S. Preq: MA 114, MA 121, ST 311 and FOR 319.* Management science and operational techniques in forestry. Logging road layout and construction, and machine systems: harvesting machine optimization and selection. Harvesting, production and forest planning. Decision and inventory theory, and other techniques for solving problems typically encountered in forest operations management. Required overnight weekend field trip.

FOR 444 Wood Procurement Management. *3(2-3-0) . S. Preq: FOR 374 and FOR 319.* Market structure and behavior for wood product raw materials. Evaluation of alternative procurement strategies and introduction to the legal and business principles important in the wood products trade. Practice in appraising multi-product tracts and in predicting future raw material availability. Includes visits to a range of manufacturing facilities and procurement organizations. Required all-day field trips held one week prior to the start of the semester.

FOR 450 Professional Development IV: Leadership. *1(1-0-0) . S. Preq: Junior standing.* Concepts and applications of leadership principles with emphasis on leadership challenges and opportunities for professionals in natural resources management. Assessment and development of leadership skills.

FOR 460 Renewable Natural Resource Management and Policy. *3(3-0-0) . F. Preq: Junior standing.* The interaction of legal principles and governmental institutions in the development and implementation of natural resource policy and management. Legal principles, constitutional provisions and the location and organization of governmental programs. Examples from both historic and current case studies.

FOR (FW) 485 Natural Resources Advocacy. *3(2-3-0) . F,S. Preq: ENG 333: JR or SR level with at least 10 hrs. of Biology.* Analysis of natural resources problems affecting management agencies and user groups. Emphasis on professional attitudes, policies, and communication skills needed for management of sensitive natural resource issues. Guest professionals sharing their perspectives on dealing effectively with natural resource clientele groups. Student discussions, team projects, technical presentations citing popular articles on natural resources subjects.

FOR 490 Senior Seminar in Forestry. *1(1-0-0) . F,S. Preq: Senior standing.* Attend departmental or university seminars or group discussions weekly to enrich and broaden student perspectives. Oral or written summaries of these seminars.

FOR (NR) 491 Special Topics in Forestry and Related Natural Resources. *1-4. F,S. Preq: Consent of Instructor.* Independent (or group) study or research of a forestry or related natural resources topic with a faculty supervisor of the student's choice. Also courses offered on a trial basis.

FOOD SCIENCE

FS 201 Food Science and the Consumer. *3(3-0-0) . F.* Science and practice of providing a wholesome, nutritious, economical and readily available supply of basic and processed foodstuffs. Chemical nature of foods, nutritional requirements, health-related dietary considerations, microorganisms, foodborne illnesses, preservation and processing, food additives, food labeling, food safety and the consumer.

FS 231 Principles of Food and Bioprocess Engineering. *4(3-3-0) . S. Preq: PY 211.* Engineering concepts and their applications to the food and bioprocessing industries. Mass and energy balances and principles related to fluid flow, heat transfer, refrigeration and freezing, psychrometrics, and selected unit operations found in these industries.

FS 290 Careers in Food and Bioprocessing Sciences. *1(1-0-0) . F.* Careers and opportunities related to food and bioprocessing industries and regulatory agencies. Development of professional enhancement skills. Resume preparation, interviewing techniques, leadership development, oral and written communication, and team building. Benefits of undergraduate research, internships, and graduate education.

FS 295 Special Topics in Food Science. *1-4. F,S,Sum.* Offerings of new or experimental courses in Food Science at the early undergraduate level.

FS (ANS, NTR) 301 Introduction to Human Nutrition. *3(3-0-0) . F,S,Sum. Preq: Sophomore standing.* Functions, dietary sources and deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery.Food science majors may use as a free elective only.

FS (ANS, PO) 322 Muscle Foods and Eggs. *3(2-2-1) . F. Preq: ZO 160,BIO 181,BIO 183, or BIO 125.* Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante- and post-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processedmeat items.

FS (ANS) 324 Milk and Dairy Products. *2(2-0-0) . S. Preq: ZO 160,BIO 181,BIO 183, or BIO 125.* Composition of milk and dairy products, federal standards, raw milk procurement, cleaning and sanitizing and quality attributes.

FS (ANS, PO) 350 Introduction to HACCP. *3(3-0-0) . F,S.* Introductory course on the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants.Offered only as a world wide web course through the Office of Instructional Telecommunications.

FS 351 Sanitation Standard Operating Procedures in Food Safety Control. *3(3-0-0) . F,S.* This course is one of a series of six courses that are part of North Carolina State University's Food Safety Certification program. SSanitation Standard Operating Procedures (SSOP's) in Food Safety Control$ addresses current federal regulatory requirements for seafood, meat, and poultry processing operations. The course also addresses the international dimensions of sanitary standards in import/export of food. The course is designed to provide the student with the background necessary to develop, implement and maintain a sanitation plan based on sanitation standard operating procedures (SSOP's).

FS 352 Introduction to Microbiological Food Safety Hazards. *3(0-0-0) . F, S.* For non-science students. The course is designed to provide an introduction to the more prominent microbial foodborne safety hazards and their control. Lessons are provided on specific pathogens, their pathogenesis and transmission and the scientific basis for specific control options. In addition, the course provides up-to-date information on current Shot-topics$ in food microbiology, including food safety regulations and emerging food safety issues.Course is offered to non-science majors. Students may not receive credit for both FS 352 and FS 405.

FS 353 Good Manufacturing Practices. *3(0-0-0) . F, S. Preq: FS 201.* Food Safety sanitation in the United States is primarily regulated by FDA under their SGood Manufacturing Practices (GMP).$ This course will introduce the student to the GMP and consider how and why they were developed. Students will become familiarwith the issues of compliance and consider the regulations in light of international laws and current practices. The student should have some familiarity with food processing and safety.

FS 354 Food Sanitation. *3(0-0-0) . F, S. Preq: FS/ANS/PO 350 or equivalent HACCP industry experience.* Discussion of hygienic practices, requirements for sanitation programs, and modern sanitation practices in food processing facilities. At the end of this course, students will have the knowledge to develop and maintain a sanitation program.

FS (NTR) 400 Principles of Human Nutrition. *3(3-0-0) . F. Preq: CH 220 or 221; ZO 160, or BIO 181/183.* Overview of fields of nutritional sciences; functions of nutrients in the human body; sources and properties of nutrients; relationships of food industry practices to nutrition.

FS 402 Chemistry of Food and Bioprocessed Materials. *4(3-3-0) . F. Preq: CH 220 or 221.* The course focuses on the properties of biological molecules (e.g., proteins, enzymes lipids, carbohydrates and pigments) found in foods and pharmaceuticals. Basic elements of molecules, such as structure and reactive groups, are presented in regardto how they affect the properties of foods and pharmaceuticals. Reactions such as Maillard browning and lipid oxidation are discussed regarding mechanisms, products and controlling processes. Laboratory experiments emphasize basic concepts discussedin lecture and provide a practical working knowledge of select analytical equipment.

FS 403 Analytical Techniques in Food & Bioprocessing Science. *4(2-6-0) . S. Preq: FS 402.* Principles, methods and techniques for quantitative physical and chemical analyses of food, nutraceutical, and pharmaceutical products. Results of analyses evaluated in terms of quality standards and governing regulations.

FS (MB) 405 Food Microbiology. *3(3-0-0) . F. Preq: MB 351.* Microorganisms of importance in foods and their metabolic activities. Sources of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction ofmicroorganisms in foods and the kinetics involved. Conversions of raw foods by microorgasnisms into food products. Microbiological standards for regulatory and trade purposes.

FS (MB) 406 Food Microbiology Lab. *1(0-2-1) . Coreq: FS (MB) 405.* Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.

FS 407 Risk Analysis and Hazard Analysis in Food Safety. *3(3-0-0) . F,S. Preq: FS/ANS/PS 350 or equivalent HACCP industry experience.* In-depth focus on the application of the first HACCP principle, Hazard Analysis, on the identification of food safety hazards, as well as the emerging importance of risk assessment. Distance Education Only.

FS 416 Quality Control in Food and Bioprocessing. *3(2-3-0) . S. Preq: FS 402, MB 351.* Organization and principles of quality control in the food and bioprocessing industries. Regulations and process control to maintain safety and quality. Evaluation of physical, microbiological, chemical, sensory, and stability testing for food and bioprocessed materials. Risk assessment, hazard analysis and critical control point (HACCP), process control, water quality, waste water analysis and reduction. Cleaning and sanitation and compliance inspection.

FS 421 Food Preservation. *3(2-3-0) . F. Coreq: MB 351.* Methods employed in food preservation. Emphasis on thermal, freezing, drying and fermentation processes and corresponding physical, chemical, and organoleptic changes in product. Relationship of these preservation techniques to development of an overall processing operation.

FS 425 Processing Dairy Products. *3(2-3-0) . Preq: FS 324, 421.* Unit operations in dairy processing. Formulation, processing, packaging and evaluation of fluid milk and manufactured products.

FS 453 Food Laws and Regulations. *3(3-0-0) . Preq: Junior standing.* Federal and state laws and regulations, and case law history affecting food production, processing, packaging, marketing, and distribution of food and food products. History of food law, enactment of laws and regulations, legal research, and regulatory agencies.Credit will not be given for both FS 453 and FS 553.

FS (HS) 462 Postharvest Physiology. *3(3-0-0) . S. Preq: BO 421.* Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

FS 475 Problems and Design in Food and Bioprocessing Science. *3(2-2-0) . S. Preq: FS 231, FS 402, FS 405 or BAE(BBS) 425.* Team approach to problem solving and product/process design and development. Ingredient functionality; formulation, safety, processing, packaging, sensory evaluation, regulatory issues, hazard analysis, critical control points (HACCP), nutritional labeling and other pertinent scientific, technical, marketing and financial aspects. Oral and written presentations are required.

FS 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by the student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FS 493 Special Problems in Food Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by the student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FS 495 Special Topics in Food Science. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering new courses on a trial basis.

FISHERIES AND WILDLIFE SCIENCES

FW (FOR, ZO) 221 Conservation of Natural Resources. *3(3-0-0) . F,S,Sum.* Importance of natural resources and their role in human environment. Physical, biological and ecological principles underlying sustainability of natural resources with attention to consequences of human impacts while meeting society needs.

FW 311 Wildlife Inventory and Management. *4(1-9-0) . Sum. Coreq: FW 312 and FW 313.* Field exercises involving natural resource inventory, habitat relationships, community structure and analysis, population estimation, forest mensuration and silviculture, GIS and GPS, habitat manipulation, and field identification of habitats and animals. Taught off-campus at Hill Forest. 4 week residential camps with side trips. Overnight trip. Additional charges for room and board.

FW 312 Fisheries Techniques and Management. *1(0-3-0) . Sum. Coreq: FW 311 and FW 313.* Field exercises in aquatic environments emphasizing assessment of habitat, fish, invertebrates, plants, and ecological relationships to form the basis of describing and solving management dilemmas. Taught off-campus at Hill Forest. 5 day residential camp. Local travel required to various aquatic ecosystems. Additional charges for room and board.

FW 313 Mountain Wildlife Ecology and Management. *1(0-3-0) . Sum. Coreq: FW 311 and FW 312.* Visit different mountain communities along an elevation gradient from 2,000 to 6,000 feet and observe changes in plant and animal communities. Discuss wildlife and fisheries management issues, interact with agency personnel responsible for managingmountain fisheries and wildlife. One-week field trip to the North Carolina mountains. Additional charges for room and board.

FW (ZO) 353 Wildlife Management. *3(3-0-0) . F. Preq: ZO 150.* Describes historical development from empirical practices to the scientific American system. The principles of management, protection, and conservation of those warm-blooded vertebrates of aesthetic, sport or food values in urban, rural and wilderness areas.

FW 403 Urban Wildlife Management. *3(3-0-0) . F. Preq: Junior standing.* Issues facing wildlife in urbanizing landscapes and the general courses of action to minimize the negative effects of urbanization on native wildlife. Large-scale planning and zoning for roads, developments and open space; meso-scale planning and landscaping of new neighborhoods and other developments; and small-scale landscaping for backyard habitats. Coexistence between wildlife and humans in urban environments and management of wildlife damage to human property.

FW (FOR) 404 Forest Wildlife Management. *3(3-0-0) . S. Preq: 9 hrs. Biological Sciences.* Relationships between forest and wildlife management and the effects of silvicultural systems on wildlife. Species-habitat requirements, forest wildlife management techniques, and forest-wildlife policies and economics.

FW (ZO) 420 Introduction to Fisheries Science. *3(3-0-0) . F. Preq: ZO 150. Coreq: ZO 260 or BO 360.* Role of fish in aquatic ecosystems, fish biology, fish ecology, fisheries management and conservation. Emphasis on aquatic ecosystems and food webs, life history and ecology of important sport and commercial fishes, population and community dynamics, and theory and practice of fisheries management and conservation. Case studies from freshwater, estuarine and marine systems.

FW (ZO) 423 Introduction to Fisheries Sciences Laboratory. *1(0-3-0) . F. Coreq: FW (ZO) 420.* General anatomy and identification of common freshwater, estuarine and marine fish, functional morphology, age and growth analyses, fish health and diets. Computer analyses of bioenergetic and population dynamics.

FW (ZO) 430 Fisheries and Wildlife Administration. *3(3-0-0) . S. Preq: PS 201, PS 202; FW(ZO)420, FW(ZO)353.* Describes and compares the administrative structures and programs of federal and state fish and wildlife agencies and develops an understanding of the basis on which these agencies function. Evaluates the interrelationships that fisheries-wildlife professionals, special interest groups, public agencies and legislative bodies play in resource management programs.

FW 453 Principles of Wildlife Science. *4(3-3-0) . F. Preq: FW 353, FW 404, FW 312.* Principles and applications of population dynamics and biology to the management of terrestrial vertebrates. Predicting population levels, composition and growth rates with and without management constraints. Strategies for wildlife conservation, utilization, and enhancement. Laboratories stress the collection and analysis of data, and often meet in outdoor environments.

FW 460 International Wildlife Management and Conservation. *3(3-0-0) . S, Alt. Yr. (even). Preq: Junior standing and above..* An international perspective on wildlife management and conservation through investigation and comparison of historical events, policies, international conservation organizations and transfrontier conservation areas. Fundamental principles necessaryin managing the African savannah ecosystem, protected areas and game ranches. Identifying global biomes, zoogeography and the impacts of ecotourism.Cannot receive credit for both FW 460/560.

FW (FOR) 485 Natural Resources Advocacy. *3(2-3-0) . F,S. Preq: ENG 333. Junior standing or Senior standing with at least 10 hours of biology.* Analysis of natural resources problems as they affect management agencies and user groups. Emphasis on professional attitudes, policies, and communication skills needed for management of sensitive natural resource issues. Guest professionals sharing their perspectives on dealing effectively with natural resource clientele groups. Student discussions, team projects, technical presentations citing popular articles on natural resources subjects.

FW 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

FW 493 Special Problems in Fisheries and Wildlife Sciences. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved

FW 495 Special Topics in Fisheries and Wildlife Science. *1-3. F,S.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

GRAPHIC COMMUNICATIONS

GC 101 Engineering Graphics I. *2(1-2-0) . F,S.* Graphical representation and solution of 2D and 3D spatial problems. Emphasis on development of logical and analytical approaches to problem solution. Conventional methods of graphically describing size and shape to represent basic mechanical elements. Includes practical engineering drawing applications.

GC 120 Foundations of Graphics. *3(2-2-0) . F,S,Sum.* Introductory course providing orientation to language of graphics for students majoring in any field. Designed to help develop ability to use CAD within the context of a concurrent design process to understand how everyday objects are designed, analyzed and created. Emphasis placed on decision-making processes involved with creating geometry and development of modeling strategies that incorporate intentions of designer.

GC (IE) 210 Introductory Engineering Graphics for Industrial Engineering. *3(2-2-0) . F,S. Preq: E 115.* Introduction to the graphical representation and solution of 2D and 3D spatial problems. Conventional methods using computer-based tools to graphically describe 2D and 3D objects relevant to the field of IE. Overview of the fundamentals and applications of computer graphics and computer-aided design. Includes practical IE drawing applications. Credit can be given for only one of the following: GC 101, GC 120, or GC/IE 210

GC 211 Introductory Engineering Graphics for Mechanical and Aerospace Engineers. *3(2-2-0) . F,S. Preq: E 115.* Graphical representation and solution of 2D and 3D spatial problems relevant to the field of mechanical and aerospace engineering using sketching and computer-based tools. Computer-aided design in the engineering design and manufacturing process. Practical mechanical and aerospace engineering drawing applications. Credit can be given for only one of the following: GC 101, GC 120, or GC 211

GC 250 Architectural Graphic Communications. *3(2-2-0) . F, S. Preq: GC 120 or GC 210 or GC 211.* Architectural Graphic Communications is an advanced graphic course designed to expand on the concepts covered in the introductory courses (GC 120, GC 210, GC 211). The emphasis is on strengthening architectural sketching and CAD drawing skills and showing how specific construction processes and materials selected for an architectural design affect commercial and residential production architectural drawings. Topics include perspective drawing, shadow projection, texturization, rendered plans,elevations and other related topics.

GC 320 3D Spatial Relations. *3(2-2-0) . F,S. Preq: GC 101 or GC 120 or GC/IE 210.* Analysis and solution of three-dimensional space problems utilizing graphic principles of orthogonal projection techniques. Application of studies of lines; surfaces; solids; surface intersections; surface development; vectors; and civil, mechanical, and geographical structures.

GC 330 Basic Technical Animation. *3(2-2-0) . F. Preq: GC 120 or GC 210 or GC 211.* Create technical animations to communicate scientific and technical information to a variety of audiences and environments. Includes performing basic skills in image processing including cropping, transformations, color manipulation and color enhancement. Students will apply basic concepts of constructing 3-D objects, spaces, and environments. Create technical animations which apply environmental attributes including surface study, texture, color, lighting models, photo-realism, and raytracing.

GC 340 Concepts of Website Development. *3(2-2-0) . S.* An introduction to the essential elements of web site development for students in Technology Education and Graphic Communications. Content focuses on planning and executing web site for educational effectiveness, user interfaces, site testing, and maintenance. Course provides instruction in software appropriate for creating a website.

GC 350 Applied CAD/D and Geometric Controls. *3(2-2-0) . F, S, Sum. Preq: GC 120 or GC/IE 210 or GC 211.* Techniques for producing mid-level computer models of individual parts and assemblies of parts. Application of conventional tolerancing and geometric tolerancing and dimensioning. Investigation of design for manufacture and CAD/CAM (Computer-AidedDesign/Computer-Aided Manufacture) processes. Conventions and standards for technical drawing documentation.

GC 410 Concepts of Desktop Publishing. *3(2-3-0) . F, S, Sum.* Provides an introduction to the concepts of electronic document production and explores the software packages involved in producing documents for print and electronic media. Structured for public school teachers and lay people. The course introduces basic standards and concepts of page layout.

GC 420 Visual Thinking. *3(2-2-0) . F,S. Preq: Engineering or technical student.* Develop visual thinking skills through a series of exercises using various visual media. Integrates and stresses drawing and construction activities essential to visual thinking. Emphasis on direct observation (seeing), mental imagery and sketching that is based upon three-dimensional space. Develops students' visual and drawing skills and provides for their application toward solving open-ended spatial problems. Intended for the scientific and technically oriented student.

GC 450 Advanced Graphics Usage with CAD. *3(2-2-0) . F,S. Preq: GC 350 or GC 250.* Advanced applications of 3-dimensional solid modeling tools in technical and engineering environments. Theory and application of manufacturing databases developed with 3-D modeling tools. Development and management of 3-D geometry using modeling software. Emphasis on application of 3-D modeling technology.

GC 496 Special Topics in Graphic Communications. *1-4. F, S, Sum.* Topical study in areas of current interest and need to students and/or needs of curricula served by Graphic Communications.

GC 498 Independent Study in Graphic Communications. *1-4. F, S, Sum. Preq: GC 120 or GC 210 or GC 211.* Independent study in areas of current interests and needs of students in the field of Graphic Communications and the visual sciences.

GRAPHIC DESIGN

GD (ID) 102 Graphic and Industrial Design Fundamentals. *6(9-2-0) . S. Preq: DF 101, Design Majors.* Introductory studio in fundamental two-dimensional and three-dimensional concepts of graphic and industrial design. Basic design principles and invention of visual and spatial form within contexts relevant to design of communication and products.

GD 200 Graphic Design Theory and Practice. *3(3-0-0) . S.* An examination of theories and critical perspectives shaping graphic practice. The course includes a discussion of contemporary design strategy in business and the role of visual communication in the information age.

GD 201 Graphic Design Studio I. *6(0-9-0) . Preq: DF 101, DF 102, Coreq: GD 217 and GD 217L.* Principles and language of graphic design. Analysis, organization, invention of two-dimensional form for the purpose of communicating information, concepts, emotions. Varied means of graphic representation are explored.

GD 202 Graphic Design Studio II. *6(0-9-0) . Preq: GD 201, GD 217. Coreq: GD 310, GD 310L, GD 317, GD 317L.* Methods and processes of graphic design problem solving. Student exercises define communication problems; evaluate analytical, synthetic, and intuitive approaches to problem solving; develop critical thinking, oral presentation, and writing skills. Emphasis on the appropriateness of form to a given context.

GD 210 Imaging for Graphic Design I. *3(1.50-3-0) . F. Preq: DF 102.* Introduction to the technical and formal issues of photography and photomechanical processes as they relate to visual communication; terminology; photographic history within the context of graphic design.

GD 217 Typography I. *3(1-4-0) . Preq: DF 101, DF 102, Design Majors, Approved minor.* Typography as a medium of visual communication. Student exercises focus on type as image and the relationship between visual and verbal language; the expressive characteristics of letter forms and text explored. Terminology, typographic history, technical issues related to typography.

GD 292 Special Topics in Graphic Design. *1-3. Preq: Consent of Instructor.* Topics of current interest in Graphic Design. Normally used to develop new courses.

GD 301 Graphic Design Studio III. *6(0-9-0) . S. Preq: GD 202,GD 310,GD 317. Graphic Design Majors. Coreq: GD 410,GD 417.* Students apply theoretical information related to semiotics and communication theory through demonstration projects. Projects center on tailoring communication to audiences and acknowledging the role of context in the interpretation of form.

GD 310 Imaging for Graphic Design II. *3(1.50-3-0) . Preq: GD 210.* Intermediate photography and introduction to digital imaging as they relate to visual communication design; simple serial imaging; using movement and point of view; discussion of examples from photography and graphic design history.

GD 317 Typography II. *3(1-4-0) . Preq: GD 217.* Exploration of design using text type and typographic technology. Student exercises explore congruency between visual and verbal hierarchies, expressive use of typographic form, format/informational organization problems, and technical details of typographic specification and computer layout.

GD 342 History of Graphic Design. *3(3-0-0) . F.* Events, ideas, movements, designs and individuals that have historical significance and influence on contemporary graphic design and the graphic design profession. Concentration on graphic design of the last 100 years.

GD 400 Advanced Graphic Design Studio. *6(0-9-0) . F,S,Sum. Preq: GD 301, GD 417, GD 342, Graphic Design Majors.* Advanced visual communication problems integrating typographic, photographic, and historical concepts in graphic design studio projects. Projects reflect applications with specific audiences, contexts, and production criteria.

GD 410 Imaging for Graphic Design III. *3(1.50-3-0) . F. Preq: GD 310, GD 310L.* Advanced photography and digital imaging; introduction to multi-media and narrative as they relate to visual communication design; discussion of authorship and images in culture and the communication environment.

GD 417 Typography III. *3(1-4-0) . F. Preq: GD 202, GD 317, Design Majors.* Systematic approaches to structuring typographic form according to information hierarchies, user needs, and visual expression. Application to the organization of tables, charts, books, magazines, and corporate identities.

GD 490 Graphic Design International Studio. *6(9-0-0) . Sum. Preq: Junior standing.* Define visual communication design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary visual communication. Directed studies in history and culture, and in artifact making. Additional travel and trip costs are required beyond registration fees, as well as appropriate immunizations.

GD 492 Special Topics in Graphic Design. *1-3. F,S,Sum. Preq: Consent of Instructor.* Topics of current interest in Graphic Design. Normally used to develop new courses.

GD 494 Internship in Graphic Design. *3(3-0-0) . F.S,Sum. Preq: Junior standing in Graphic Design and 3.0 GPA or better and written approval of department head.* Supervised field experience in graphic design offices and organizations.

GD 495 Independent Study in Graphic Design. *1-3. F,S,Sum. Preq: Junior standing in Graphic Design and 3.0 GPA or better and written approval of department head.* Special projects in graphic design developed under the direction of a faculty member on a tutorial basis.

GEOGRAPHY

GEO 200 Principles of Geography. *3(3-0-0) . S.* Basic ideas in the field of geography. The scope of geography as an academic field explored. Emphasis placed on mastery of geographic tools, e.g., maps, globes, and media materials and sources. Regional study of contemporary world.

GEO (SOC) 220 Cultural Geography. *3(3-0-0) . F,S.* An investigation of the world's past and present cultural diversity by studying spatial patterns of population, language, religion, material and non-material culture, technology and livelihoods, communities and settlements, and political organization and interaction.

GEO (ECI) 300 World Regional Geography. *3(3-0-0) . S. Preq: GEO 200.* Geography of selected industrial and Third World regions in which the evolution of settlement, culture, economy and political forms are treated in geographical perspective.

GENETICS

GN 301 Genetics in Human Affairs. *3(3-0-0) . F,S,Sum.* Appreciation and understanding of genetics in everyday life. Genetic perspective on normal human development, birth defects, birth control, cancer, organ transplants, intelligence, mental illness, and radiation and chemical exposure and issues raised by applications of recently developed genetic techniques such as in vitro fertilization, genetic engineering and prenatal monitoring.

GN 411 Principles of Genetics. *4(4-0-0) . F,S,Sum. Preq: BIO 183 or ZO 160, and Junior standing.* Basic concepts and principles of prokaryotic and eukaryotic genetics. Mendelian inheritance, polygenic inheritance, linkage and mapping, chromosome aberrations, population genetics, evolution, DNA structure and replication, gene expression, mutation, gene regulation, extranuclear inheritance, bacterial and viral genetics, and recombinant DNA technology.

GN 412 Elementary Genetics Laboratory. *1(0-3-0) . F,S. Coreq: GN 411.* Genetic experiments and demonstrations using a variety of bacterial, plant and animal organisms. Mendelian inheritance, linkage analysis, population genetics, cytogenetics, biochemical genetics, DNA isolation, electrophoresis, and Southern blotting.

GN 413 Advanced Genetics. *3(3-0-0) . F,S. Preq: GN 411.* Biological macromolecules and their interactions. Chromatin and chromosome structure. Bacteria, viruses, plants, animals and fungi as genetic systems. Transcription, RNA processing, genetic code, translation, DNA replication and the cell cycle. RFLP mapping. DNA and forensics. Molecular genetics of disease. Genetic transformation and cloning of plants and animals. Recombinant DNA methodology. Students cannot receive credit for both GN 413 and GN 513

GN 414 Genes and Development. *3(3-0-0) . S. Preq: GN 411.* Genes and genetic pathways that control development in animals; overview of early, pivotal experiments in embryology and genetics; use of molecular biology, genomics and bioinformatics to study genes and development; concentration on four model systems; presentation and discussion of major issues in developmental biology.

GN 415 Genome Science. *3(3-0-0) . S. Preq: GN 411.* Complementation of modern genomics approaches with classical and molecular genetics; goals of major genome projects in animals, plants, humans, and microorganisms; genomic science opportunities at NCSU and in the Research Triangle; presentation and discussion of current literature; and preparation for careers in genomics-related fields.

GN 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

GN 493 Special Problems in Genetics. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Arrangements must be initiated by student and approved by a faculty adviser and the departmental teaching coordinator.

GN 495 Special Topics in Genetics. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

GREEK

GRK 101 Elementary Greek I. *3(3-0-0) . F.* Introduction to Classical Greek. Greek alphabet, basic grammar and syntax. Readings based on Greek mythology, philosophy, and literature.

GRK 102 Elementary Greek II. *3(3-0-0) . S. Preq: GRK 101.* A second course in Classical Greek, continuing and expanding the work of GRK 101, and completing the study of grammar. Readings from major authors including Herodotus, Thucydides, and Xenophon.

GRK 201 Intermediate Greek I. *3(3-0-0) . F, Alt. yrs.(odd). Preq: GRK 102.* Introduction to Greek prose. Emphasis upon improvement of reading skill through vocabulary acquisition and study of complex grammar. Introduction to Attic dialect through reading Plato, and Koine Greek through reading the New Testament. Examination of the importance of these works to Western literature and culture.

GRK 202 Intermediate Greek II. *3(3-0-0) . S. Preq: GRK 201.* Reading in Homer's Iliad and the New Testament. Techniques of oral poetry. Study of the use of myth, and of the literary and historical significance of the Iliad. Analysis of differences between classical and Koine Greek in the New Testament.

GRK (LAT) 310 Classical Mythology. *3(3-0-0) . F.* Greek and Roman mythology through the writings and art of the Classical period. Discussion of creation stories, the major gods and heroes, the underworld and afterlife. Intellectual religious and educational role of myth and of the most important theories of interpretation and classification. All readings and discussion in English.

GRK 320 Greek Tragedy in Translation. *3(3-0-0) . S.* Tragedies of Aeschylus, Sophocles and Euripides in translation. Literary and social aspects of individual plays and tragic genre in fifth century. Selections from Aristophanes, Plato, Aristotle and Seneca on Greek tragedy.

GRK 333 Medical Terminology. *2(2-0-0) . S.* Study of the formation of medical terms from their Greek and Latin roots designed both to build vocabulary and to teach the uses of a medical dictionary.

GRK 371 The Origins of American Mythology. *3(3-0-0) . S, Alt. yrs.(odd).* Oral-traditional literature, formulaic myth composition and the Indo-European origins of the American folk hero. Readings include Iliad, Gilgamesh, Sanskrit Puranas and Beowulf; films such as Stagecoach and Superman.

GLOBAL TRAINING INITIATIVE

GTI 401 US Culture and Education Colloquium. *3(1-2-2) . F,S,SUM1,SUM2.* Overview of US Culture, Higher Education in America, and Student Success Skills for degree or non-degree international students. Guest faculty lectures, media presentations, field trips, and required readings form basis for discussiong roups, assignments, and capstone paper (reflecitons on issues discussed in class, personal development, and required community involvement). Includes break-out discussion groups, field trips, personal projects and research. Students may have additional travel cost associated with field trips. Enrollment limited to first year international students, participants in NC Global Training Initiative Certificate Programs, or by permission of the instructor.

HISTORY OF ART

HA 201 History of Art From Ancient Greece Through the Renaissance. *3(3-0-0) . F.* Art from Ancient Greece and Rome through Italian Renaissance. Major art forms of painting, sculpture, and architecture.

HA 202 History of Art From the Renaissance Through the 20th Century. *3(3-0-0) . S.* Art from the Northern Renaissance in Europe through the 20th century in Europe and America: painting, sculpture and architecture recent mixed media techniques such as collage, and frottage.

HA 203 History of American Art. *3(3-0-0) . S.* A history of American Art (painting, sculpture and architecture) from the Colonial Period through the 20th century.

HA 298 Special Topics in Art History. *3(3-0-0) . F,S,Sum.* Special topics in art history with emphasis on chronological periods such as 20th-century art of the Italian Renaissance or on fields of art such as paintings, sculpture, photography, or architecture.

HA 310 History of Art and Photography. *3(3-0-0) . Alt. yrs.* History of and the interaction between art and photography from the invention of photography to the present.

HA 320 American Decorative Arts. *3(3-0-0) . Alt. yrs.* History of American Art (painting, sculpture, and architecture) from Colonial Period through 20th century.

HA 395 History of Art: Study Abroad. *3(3-0-0) . F,S,Sum.* Topical History of Art courses taught in NC State Study Abroad programs. (Current listings available in History Department, Study Abroad Office and CHASS Dean's Office.)

HA 401 19th Century European Art. *3(3-0-0) . F,Alt. yrs. Preq: HA 201 or HA 202.* Major stylistic movements of 19th century European art and the theoretical basis for their development. Covers Neo Classicism, Romanticism, Realism and Impressionism, and Post Impressionism.

HA 404 Italian Renaissance Masters. *3(3-0-0) . Alt. yrs. Preq: 3 hrs. of HA.* Selected problems in the development of Italian Renaissance art including painting sculpture and architecture, 1300-1550: including the pioneers Giotto and Duccio; founders of the early Renaissance: Masaccio, Donatello, and Brunelleschi; great masters of the High Renaissance: Michelangelo, Raphael and Leonardo da Vinci. Works of art analyzed in terms of style, subject matter and historical context.

HA 498 Independent Study in History of Art. *1-6. F,S. Preq: 3 hours History of Art.* Directed independent study of topics in the History of Art.

HISTORY

HI 205 Western Civilization Since 1400. *3(3-0-0) . F,S.* A survey of Western Civilization from the Renaissance to the present.

HI 207 Ancient World to 180 A.D. *3(3-0-0) . F,S.* The ancient cultures of the Middle East, Greece and Rome, including Mesopotamian, Egyptian, Hebrew, Phoenician, Greek and Roman societies and cultures.

HI 208 The Middle Ages. *3(3-0-0) . F,S.* Medieval civilization as it emerged from the declining Roman Empire through its apogee in the 13th century. The transition from the classical to the medieval world, the impact of the Germanic influx, the Islamic influence, the Crusades, and the political, economic, and social institutions of the High Middle Ages.

HI 209 Europe, Renaissance to Waterloo, 1300-1815. *3(3-0-0) . F,S.* Transition from the medieval to modern Europe; decline of medieval institutions, Renaissance, Reformation and Counter-Reformation, rise of Absolutism, English 17th-century revolution, French Revolution and Napoleonic era.

HI 210 Modern Europe 1815-Present. *3(3-0-0) . F,S.* Survey of the history of European societies and political systems from 1815 to the present.

HI 215 Latin America to 1826. *3(3-0-0) . F,S.* The origins and development of social, political, economic and religious institutions from pre-conquest times to the achievement of independence. The ancient American cultures; Spain and Portugal before 1492; conquest and settlement, Spanish rule in theory and practice, economic life, the Church, land and labor; the African contribution; the Portuguese in Brazil; the independence movements.

HI 216 Latin America Since 1826. *3(3-0-0) . F,S.* Social, political, economic, and intellectual life in the 19th and 20th centuries in Central and South America. The social structure of the new nations; 19th century liberalism; the force of tradition; relations with Europe and the United States; economic change; caudillo rule; 20th century upheavals; revolutions; political conflict.

HI 221 British History to 1688. *3(3-0-0) .* History of the British peoples from earliest times to the Glorious Revolution. Social, political, constitutional developments; relationship between history and literature; synthesis of British cultures.

HI 222 History of British Cultures and Societies From 1688. *3(3-0-0) .* British people from Glorious Revolution to the present. Social, political, constitutional development; history and literature; growth and decline of British empire; spread of British culture.

HI 233 The World in the 20th Century. *3(3-0-0) . F,S.* National and international problems in the 20th Century Western and non-Western world; institutions and ideas at the turn of the century, origins and effects of the First World War, the postwar challenge to Western democratic supremacy, the Second World War, and problems of the postwar period.

HI 251 Early American History. *3(3-0-0) . F,S.* Themes in early American history: colonial clash and mix of culture; generation of an American consciousness; federalism and democracy in national politics; expansion and immigration; racial and sectional division.

HI 252 Modern American History. *3(3-0-0) . F,S.* Themes in modern American history: impact of war on American foreign and domestic policy; the repercussions of industrialization and economic modernization; continuity and change in American institutions and values; problem solving in pluralistic society.

HI 263 Asian Civilizations to 1800. *3(3-0-0) . F.* Introductory survey of the great civilizations of Asia; particular attention to India, China and Japan. Emphasis on comparative study of Asian religions, political systems, art, and literature.

HI 264 Modern Asia: 1800 to Present. *3(3-0-0) . S.* Introductory survey of 19th and 20th century Asia, with attention to Japan, Southeast Asia, India and China. Emphasis on cultural and political crises of the 19th century and revolutionary transformations of the 20th century.

HI 270 Modern Middle East. *3(3-0-0) . F.* Social and political change in the Middle East in the nineteenth and twentieth centuries. Decline of the Ottoman empire, the rise of nationalism, the waxing and waning of European imperialism in the region, and the creation of modern states and societies and their ideological and economic underpinnings.

HI (AFS) 275 Introduction to History of South and East Africa. *3(3-0-0) . F, S, Sum.* The African kingdoms (Lunda, Buganda, and Zulu); the European encroachment; the origins of colonialism and the character of colonial societies and economies, South African apartheid; African protest, nationalism and independence.

HI (AFS) 276 Introduction to History of West Africa. *3(3-0-0) . F,S.* The history of Western Africa. Forest civilizations and the slave trade, trade and the expansion of Islam, colonialism in West Africa; African nationalism and the achievement of independence; and postcolonial West Africa.

HI 295 First-Year Seminar in History. *3(3-0-0) . Prerq: CHASS first-year student.* Topical introductory history course in the CHASS First-Year Semitar offerings. (Current listings available in the CHASS Dean's office and in the History Department)

HI 300 Sophomore Seminar in History. *3(3-0-0) . F,S. Preq: Sophomore standing, History Majors. Coreq: HSS 100.* Introduction to the process of researching and writing history. Techniques for locating and interpreting primary sources. The craft of historical writing. Analysis and criticism of the varieties of history. Basic computer literacy: basic computingterms, electronic mail, online searching of the NCSU Libraries, use of the Internet, and word processing.

HI (REL) 320 Religion in American History. *3(3-0-0) . F. Preq: 3 hours of History or Sophomore standing.* Representative people, movements, and thought in the major religions within the context of American society and culture.

HI 321 Ancient and Medieval Science. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* Selected topics in the history of pre-modern science are studied for both their intrinsic interest and to gain perspective on the nature of modern science. Examples are taken from pre-history, Mesopotamia, Egypt, Greece, Rome, Islam, and the medieval Christian West, with the possibility of comparisons to other cultures.

HI 322 Rise of Modern Science. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* Science in the Renaissance and Scientific Revolution of the 16th and 17th centuries. Newtonian science. Mechanics and the chemical revolution in the 18th century. Scientific synthesis in the 19th century: physics, chemistry, geology, and biology. 20th century revolutions in physics. Attention is paid both to scientific ideas and to the cultural and institutional contexts of science.

HI 335 The World at War. *3(3-0-0) . S. Preq: 3 hours of History.* Comparative history of the experience of war over time and place. Topics include the interactions between war and society; effects on combatants and non-combatants, especially women and children; and the role of technology.

HI 341 Technology in History. *3(3-0-0) . S. Preq: 3 hours of History or Sophomore standing.* The role of technology in society from earliest times to the present. Major achievements in technology and an examination of the nature of invention, innovation and adaptation of technologies and their impact on Western Civilization.

HI 350 American Military History. *3(3-0-0) . F,S. Preq: 3 hours of History or Sophomore standing.* American military experience and its relationship to other historical developments. Use of military force in terms of strategy and tactics and as an element in the nation's diplomatic, political, social, economic and intellectual life.

HI 351 U.S. Naval History. *3(3-0-0) . S. Preq: 3 hours of History or Sophomore standing.* The role of the U.S. Navy in American history. Sea power, national defense and foreign policy. The impact of technology on naval warfare and the historical evolution of missions of the U.S. Navy.

HI 364 History of North Carolina. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* History of North Carolina from early European exploration to the present. Features of North Carolina society which made this state similar to and different from other southern states and the nation as a whole.

HI 365 The American West. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* A history of the American Frontier with emphasis on the trans-Mississippi West. Cycles of exploration, conquest, and exploitation of this region. Influence of the frontier in the development of the United States.

HI (AFS) 372 African-American History Through the Civil War, 1619-1865. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* African background and continuity of the particular role, experience and influence of African Americans in the United States through the Civil War.

HI (AFS) 373 African-American History Since 1865. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present.

HI 380 History of Nonprofits, Philanthropy, and Social Change. *3(3-0-0) . F. Preq: 3 hours of History or Sophomore standing.* Historical development of nonprofits and philanthropy in the United States from the colonial period to the present--including origins of charity and philanthropy as concepts for social change and social justice, rise of benevolent societies, creation of philanthropic foundations and advocacy organizations, and relationships between modern nonprofits, the state, and the private sector.

HI 395 History: Study Abroad. *3(3-0-0) . Preq: 3 hours of History or Sophomore standing.* Topical History courses taught in NCSU Study Abroad programs. (Current listings available in Study Abroad Office, CHASS Dean's Office and History Department).

HI 400 Civilization of the Ancient Near East. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C. Credit for both HI 400 and HI 500 is not allowed

HI (REL) 402 Early Christianity to the Time of Eusebius. *3(3-0-0) . S, Alt. yrs.(odd). Preq: One of: REL 312, REL 317, or HI 207.* Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox Christian movements; anti-heretical writings; orthodox institutions of authority.

HI 403 Ancient Greek Civilization. *3(3-0-0) . Alt yrs. Preq: 3 hours of History.* The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides.

HI 404 Rome to 337 A.D.. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* The development of ancient Rome from its origins in Italy, through the rise as an Empire embracing the entire Mediterranean World and Western Europe, to Constantine, Christianity and the foundation of Constantinople. Examines critically the political achievement of a people who rose from an obscure Italian city to a world empire, with emphasis on the analysis of primary sources. Credit will not be given for both HI 404 and HI 504

HI 405 History and Archaeology of the Roman Empire. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Analysis of Rome's rule over the Mediterranean World in the first four centuries A.D. through the use of literary and archaeologic sources. Special emphasis on imperial army and frontier security. Credit will not be given for both H1 405 and H1 505

HI 406 From Roman Empire to Middle Ages. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Late Antiquity and the early Middle Ages. The transition from classical civilization to the basis of modern civilizations; the fall of Rome, the Germanic kingdoms, Byzantium, the establishment of Christianity, the birth and growth of Islam. Credit will not be given for both HI 406 and HI 506

HI (REL) 407 Islamic History to 1798. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art, and architecture. Islam in Spain, India, Asia, and Africa, the Crusades, the Ottomans, Islam and Europe. Credit will not be given for both HI 407 and HI 507

HI (REL) 408 Islam in the Modern World. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History or Religious Studies.* Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world.

HI 409 The High Middle Ages. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Medieval culture from 10th through 13th centuries: revival of the Roman Empire, monastic and papal reform, rise of universities, evolution of representative bodies, the Gothic style, troubadour and goliardic poetry, scholasticism, and revival of Roman law. Credit will not be given for both HI 409 and HI 509

HI 410 Italian Renaissance. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Renaissance humanism, an educational ideal and an awareness of man as the sole creator in the historical world, is examined in its relationship to the Italian republics and principedoms of the 14th through the 16th century. Credit will not be given for both HI 410 and HI 510

HI 411 The Protestant and Catholic Reformation of the 16th Century. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* The conditions and criticisms which led to reform and the nature of the institutional and theological changes affected by the various churches and sects. Special attention to Luther and Calvin. Credit will not be given for both HI 411 and HI 511

HI 412 The Sexes and Society in Early-Modern Europe. *3(3-0-0) . F. (ALTYREVEN).* Examination of changes in gender relations; ideas about the sexes, femininity, and masculinity; the roles of women and men in political, religious, economic, scientific, and family life in Europe between the late Middle Ages and the French Revolution. Credit for HI 412 and HI 512 is not allowed.

HI 414 France in the Old Regime. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* France from the sixteenth century to the Revolution, development of renaissance and absolutist state, social and economic change, religious reform and Enlightenment, origins and beginnings of the revolution. Credit will not be given for both HI 414 and HI 514

HI 415 The French Revolution. *3(3-0-0) . Preq: Junior standing.* Broadly based analysis of France's first revolutionary era; the enlightenment and its impact, the causes and character of the Revolution in France; impact of these events in France and Europe. Credit will not be given for both HI 415 and HI 515

HI 418 Fascist Italy and Nazi Germany. *3(3-0-0) . F. Preq: Junior standing.* Fascism as a theoretical concept, rise of fascism in Italy and Germany, seizure of power by Mussolini and Hitler, organization of the economy, churches, military, women, youth, and culture under the dictatorships. Students will not receive credit for both HI 418 and HI 518

HI 419 Modern European Imperialism. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Historical background of European overseas expansion; its impact on the economics, politics and culture of both Europe and the colonized world; the significance of imperialism and anti-colonial nationalism in shaping the modern world. Credit will not be given for both HI 419 and HI 519.

HI 420 European Diplomatic History. *3(3-0-0) . S, Sum. Preq: 3 hours of History.* Survey of major events in European international relations, including the Congress of Vienna in 1815, the unification of Germany, World War I and II, the origins of the Cold War, European unification, and the crisis of the Soviet bloc. Credit will not be given both for HI 420 and HI 520

HI 421 European Intellectual History: The Eighteenth Century. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Historical examination of some of the major figures of the European Enlightenment, beginning with Locke and ending with Kant. Credit will not be given for both HI 421 and HI 521

HI 422 European Intellectual History: The 19th Century. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Historical examination of some of the major figures of European thought during the 19th century, beginning with the enthusiasm of the period of the French Revolution and ending with the disillusionment of the fin de siecle. Credit will not be given for both HI 422 and HI 522

HI 423 Women in European Enlightenment. *3(3-0-0) . S, Alt yrs(even). Preq: 3 hours of History, Junior standing.* Historical examination of construction of female 'nature', resources available to women writers and intellectuals, and constraints on womens' education, writing and publication during the Enlightenment period.

HI 425 Tudor and Stuart England. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* British history from the Reformation through the Civil War. Emphasis on key developments in social, political and economic life: The development of a new concept of kingship, the growing independence of Parliament, the search for religious uniformity and the changing status of the aristocracy and gentry. Credit will not be given for both HI 425 and HI 525

HI 429 20th Century Britain. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* British political, social and economic history since 1914, with reference to the effects of two world wars, the growth of the Welfare State, Britain's decline as a power, and its search for a new role in the world.

HI 430 Modern France. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* French history from the downfall of Napoleon I to the present, with a short introductory survey of the Old Regime and the French Revolution. Cultural, social and economic developments and political trends. Credit will not be given for both HI 430 and HI 530

HI 431 Germany: Luther to Bismarck 1500-1871. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Germany from the Reformation to the completion of national unification in 1871. Emphasizes the impact of socioeconomic changes on politics and culture. Credit will not be given for both HI 431 and HI 531

HI 432 History of Germany Since 1871. *3(3-0-0) . Alt yrs. Preq: 3 hours of History.* German history from the unification of 1871 to the present, concentrating on problems of nationalism and political and social reform. Credit will not be given for both HI 432 and HI 532

HI 438 The Russian Empire to 1917. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* Russian Empire to the Revolution of 1917. Kiev Rus and the Mongol conquest, serfdom, territorial expansion, cultural insularity of the Great Russian state in Moscow, Westernization, reform, and great power status in 18th and 19th centuries, peoples of the multi-national empire, cultural, educated society, and revolutionary opposition, industrialization, rapid urbanization, war, and revolution.

HI 439 History of the Soviet Union And After. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Soviet state and society from the 1917 Revolution, including the post-Soviet situation. Political disarray and resistance to the Bolshevik regime, 1917-21; industrialization, urbanization, and application of coercive techniques of rule; popular reconciliation with Party state and great power status during World War II and after; fate of non-Russian nationalities; de-stalinization, stagnation, and the failed attempt at Party renewal after 1985. Credit will not be given both for HI 439 and HI 539

HI 440 American Environmental History. *3(3-0-0) . F. Preq: 3 hours of History.* Interactions between humans and their environments in America; environmental focus on themes in American history such as colonial settlement, industrialization, progressivism, the New Deal, the 1960s.

HI 441 Colonial and Revolutionary U.S. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Origins of the English colonies in America to the American Revolution. European background to colonization, merging of different cultures, effects of mercantile doctrine, causes of revolution. Credit will not be given for both HI 441 and HI 541

HI 442 Creating the Constitution : Origins and Development. *3(3-0-0) . S, Alt. yrs.(odd). Preq: 3 hours of History.* Analysis of state and federal constitutions developed in the United States after 1776. Theories behind a federal constitution; the Philadelphia Convention of 1787; the ratification debate; and the bill of rights.

HI 443 U.S. Constitutional History to 1883. *3(3-0-0) . F, Alt. yrs even. Preq: Junior standing.* This course examines the origins and development of the U. S. Constitution from the Articles of Confederation to 1883. The course specifically looks at the federal Convention of 1787, the national bank debate and early constitutional interpretationthe constitution and its interaction with politics, economics, and society; the powers of Congress-taxation, contracts, commerce and war. The course also examines sovereignty, slavery and civil rights. It ends with an analysis of the Civil War Amendments and the transformation in American constitutionalism. Credit for both HI 443 and HI 543 is not allowed

HI 444 U.S. Constitutional History Since 1870. *3(3-0-0) . S. Preq: Junior standing.* Examines the transformation of American Constitutional thought after the Civil War; the triumph of nationalism and the evolution of a new federal theory; the rise and fall of federal protections of civil rights in the late 19th-century and the CivilRights Revolution in the 20th century. Explores key concepts as civil liberties, judicial activism and judicial restraint; procedural and substantive due process, liberty of contracts and entrepreneurial liberty, Japanese internment, privacy, women and gender issues; explores free speech, religious freedom, civil liberties. Credit for both HI 444 and HI 544 is not allowed.

HI 445 Early American Frontier. *3(3-0-0) . S, (ALTYRODD).* Examines the social, political, and cultural development of the eastern American frontiers between the early seventeenth and mid-nineteenth centuries. Addresses the relationships between settlers and environments, settlers and Native Americans. Explores the structure and life of pioneer families, the development of new institutions, the role of governments in regulating settlements, and the evolution of the Sfrontier myth.$ Credit cannot be given for both HI 445 and HI 545.

HI 446 Civil War and Reconstruction. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Examination of sectional polarization of the 1850's, impact of the war on both northern and southern societies, and trauma of reconstructing the Union. Credit will not be given for both HI 446 and HI 546

HI (WGS) 447 History of American Women to 1900. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* The historical experience of women in America from the colonial period to 1890. Women's work, education, legal and political status, religious experience, and sex roles: age, class, race, sexual preference, and region as significant variables in women's experience.

HI (WGS) 448 American Women in the Twentieth Century. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Women's historical experience in America, 1890-1990. Changes in women's work, education, legal and political status, and sex roles, age, class, race, sexual preference, and region as significant variables in women's experience. Credit will not be given for both HI 448 and HI 548

HI 449 U.S. Labor to 1900. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* History of work, workers, and working-class organizations and politics in colonial and nineteenth-century America. Credit will not be given for both HI 449 and HI 549

HI 450 U.S. Labor Since 1900. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* History of work, workers, and working-class organizations and politics in twentieth-century America. Credit will not be given for both HI 450 and HI 550

HI 451 The Vietnam War. *3(3-0-0) . S. Preq: 3 hours of History.* Analysis of U.S. involvement in Vietnam, including an introduction to Vietnamese history, why the United States intervened in Vietnam, the various forms U.S. intervention took, which Americans went to Vietnam and what they expected there, the consequences of U.S. involvement for Americans and Vietnamese, the effort to end American participation in the war, and the war's legacy. Credit for both HI 451 and HI 551 is not allowed

HI 452 Recent America. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Examination of contemporary opinions and historical interpretations of major problems in American life since 1939, including World War II, its social and economic consequences; Korea and the Cold War, big business and labor; civil rights and feminist movements; countercultures, Vietnam and Watergate. Credit will not be given both for HI 452 and HI 552

HI 453 United States-Latin American Relations Since 1823. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Analysis of periods, issues, and events in U.S.-Latin American relations since 1823: Monroe Doctrine, Manifest Destiny, Mexican and Spanish-American Wars, Dollar Diplomacy, Good Neighbor Policy, anti-Communist crusade since 1945, Alliance for Progress, U.S. responses to revolution. Historical perspective on contemporary inter-American problems on drugs, environment, debt crisis, and human rights abuses. Credit will not be given both for HI 453 and HI 553

HI 454 History of U.S. Foreign Relations, 1900-Present. *3(3-0-0) . Preq: Junior standing.* America's emergence as a world power; American diplomatic history since 1900; the expansion of American economic and cultural relations; the evolution of the American foreign policy bureaucracy; and the historical forces and personalities that have shaped American relations with other nations. Credit for both HI 454 and HI 554 will not be allowed

HI (AFS) 455 History of the Civil Rights Movement. *3(3-0-0) . Alt. yrs.. Preq: Junior standing.* The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for HI 455 and HI 555

HI 456 Early American Thought. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* American intellectual history to 1865. Influence of reformation, enlightenment, scientific revolution, capitalism and romanticism on social and political order. Credit will not be given for both HI 456 and HI 556

HI 457 Twentieth-Century U.S. Intellectual History. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* American intellectuals and their views on 20th-century topics such as politics, culture, race and gender in historical context. Credit for both HI 457 and HI 557 is not allowed

HI 458 Modern American Historical Biography. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Credit will not be given for both HI 458 and HI 558. American history in the 20th century through the medium of historical biography. Credit will not be given for both HI 458 and HI 558

HI 459 The Early American Republic. *3(3-0-0) . S. (ALTYREVEN).* Examines the social, political, and cultural development of the Early Republic, the period in American history roughly from the Revolutionary War through the Administration of John Quincy Adams. Employs the life of Thomas Jefferson-the quintessential American, as the foundation for delving into the historical problems, interpreting primary sources, and analyzing secondary sources. encourages graduate students to analyze the ways in which historiographic debates complicate our understanding of the Early American Republic. Credit will not be given for both HI 459 and HI 559.

HI (REL) 460 American Religion After Darwin. *3(3-0-0) . F,S. Preq: 3 hours of Religion or History.* Major religious issues in America from the Civil War to the mid-1920s, including science and religion, the impact of Darwin's evolutionary theory, biblical criticism, liberalism versus fundamentalism, the churches in an industrial society. Credit for both HI(REL)460 and HI(REL)560 is not allowed

HI 461 Civilization of the Old South. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* The distinctive features of the Old South as part of the regional development of United States history. Consideration of colonial factors in the making of the South, development of the plantation system and slavery, Southern social order, intellectual and cultural life, economic development, and rise of Southern nationalism. Credit will not be given for both HI 461 and HI 561

HI 462 Social History of the New South. *3(3-0-0) . F. Preq: 3 hours of History.* Analysis of the change and continuity in the American South from the end of the Civil War through the present. Credit will not be awarded both for HI 462 and HI 562

HI 465 Oil and Crisis in the Gulf. *3(3-0-0) . S, Alt.Yr.(even). Preq: 3 hours of History or Sophomore standing.* Historical roots and development of the Persian Gulf region from the late nineteenth century until the present with an emphasis on the social, economic, cultural and political transformations following the discovery of oil, and subsequent events such as the Arab Oil embargo of 1973, the Iranian Revolution, the Iran-Iraq war, and the two Gulf wars.

HI 466 History of the Palestinian-Israeli Conflict. *3(3-0-0) . F, Alt.Yr.(even). Preq: 3 hours of History or Sophomore standing.* Historical roots and development of the Palestinian-Israeli conflict from the late nineteenth century until the present through the study of the history and historiography of Zionism, Palestinian nationalism, creation of the state of Israel, establishment of settlements, conflicts and peace negotiations, as well as a study of the impact of this conflict on both Israeli and Palestinian societies, economies and cultures.

HI 467 Modern Mexico. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* Major developments in Mexican national life since 1821. The 19th century: the era of Santa Anna, the war with the United States, the Reform, the French intervention, and the dictatorship of Profirio Diaz. The 1910 Revolution and the resulting transformation of Mexico's political, social and economic institutions. Reading knowledge of Spanish helpful but not required.

HI 469 Latin American Revolutions in the Twentieth Century. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Comparative analysis of causes, participants, process, and outcome of revolutions in Mexico, Bolivia, Cuba, and Central America. Credit for both HI 469 and HI 569 will not be given

HI (EB) 470 Seminar: Teaching World History. *3(3-0-0) . S. Preq: 3 hours of History.* Introduction to historiography and themes of world history; designed for, but not restricted to, LTH students planning to teach world history.

HI 471 Revolutionary China. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* China 1900 to present. Examination of political, cultural, and socio-economic revolutionary phases of China's 20th-century transformation from traditional empire to communism. Particular attention to post-1949 problems of nation-building. Credit will not be given for both HI 471 and HI 571

HI 472 Modern Japan, 1850 to Present. *3(3-0-0) . Alt. yrs. Preq: 3 hours of History.* Japan's emergence as a modern nation and world power. Topics include nation-state formation; modernization and its dislocations; democratization and authoritarianism; imperialism, international politics, and war; postwar reforms; changing gender relations; popular culture; and social problems. Credit will not be given for both HI 472 and HI 572

HI 473 Japan's Empire in Asia, 1868-1945. *3(3-0-0) . F, Alt. yrs.(even). Preq: 3 hours of History, Junior standing.* An advanced survey of Japanese relations with Asia in the nineteenth and twentieth centuries. Structures and ideologies of imperialism and colonialism; modernization, nationalism and social change; migration and mobility; resistance and collaboration; and legacies of empire. Credit will not be given for both HI 473 and HI 573

HI 474 Modern India. *3(3-0-0) . F, Alt. yrs.(even). Preq: 3 hours of History.* The history of the Indian sub-continent, from the 16th century to the present. Focus on political, economic and cultural change under the Mughal Empire and the British Raj; the problems of independent India, Pakistan and Bangladesh.

HI (AFS) 475 History of the Republic of South Africa. *3(3-0-0) . F,S. Preq: 3 hours of History.* Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI 475 and HI 575.

HI (AFS) 476 Leadership in Modern Africa. *3(3-0-0) . Alt. yrs.. Preq: 3 hours of History.* Recent sub-Saharan African political history (excluding South Africa). Overview of concepts, vocabulary, historical trends. Detailed examination of specific African countries as case studies, such as Ghana, Nigeria, Zimbabwe, Tanzania.

HI 477 Women in the Middle East. *3(3-0-0) . S, Alt. yrs.(odd). Preq: 3 hours of History.* The varied forces influencing lives of women in Middle East from beginning of Islam to present.

HI 478 Islam and Christianity in Sub-Saharan Africa. *3(3-0-0) . S. Preq: 3 hours of History.* Expansion and interaction of Islam and Christianity in sub-Saharan Africa in the nineteenth and twentieth centuries, and their influence and impact on the economy, politics, and society. Topics include missionary activity, resistance to imperial authority, the role of the churches, and the influence of religion on leadership, education, nationalism, and post-colonialism.

HI (AFS) 479 Africa (sub-Saharan) in the Twentieth Century. *3(3-0-0) . S, Alt. yrs.(even). Preq: 3 hours of History.* Developments in sub-Saharan Africa during the colonial period, from the end of the nineteenth century to the advent of decolonization in the early 1960s. Interplay of political, social, economic and cultural factors in the experiences of African peoples during this period. Credit will not be given for both HI 479 and 579

HI 480 Scientific Revolution: 1300-1700. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* Factors behind dramatic scientific changes of the seventeenth century. Role of mathematics and experiment. Interaction of the new science with trends in philosophy, religion, alchemy, magic, medicine, and with institutional, educational, political, economic and technological factors. Credit will not be given for both HI 480 and HI 580.

HI 481 History of the Life Sciences. *3(3-0-0) . Alt. yrs. Preq: Junior standing.* The major ideas, methods, institutions, and individuals that have contributed to the biological sciences from Renaissance to modern times. The connections between the life sciences and other aspects of culture, including the physical sciences, religious belief, medical practice, and agriculture. Credit will not be given for both HI 481 and HI 581

HI 482 Darwinism in Science and Society. *3(3-0-0) . S, Alt. yrs(even). Preq: 6 hours of Advanced History.* Scientific development of Darwinism and its reception by the scientific community and the general public. Social impact of theories of evolution as reflected in Social Darwinism, eugenics, sociobiology, and relationship of sciences to ethics and religion. Credit will not be given both for HI 482 and HI 582

HI 483 Science and Religion in European History. *3(3-0-0) . S, Alt. yrs.(odd). Preq: 3 hours of History, Junior standing.* The historical conflict between science and religion; crisis of religion; science as a new cultural authority; political and institutional landscape of science and religion in Europe. Credit will not be given for both HI 483 and HI 583

HI 484 Science in European Culture. *3(3-0-0) . F. Preq: 3 hours of History, Junior standing.* Relationship between science and culture in European history; evaluation of 'two cultures' thesis; scientific instruments, universal expos, science and literature. Credit will not be given for both HI 484 and HI 584

HI 485 History of American Technology. *3(3-0-0) . S. Preq: 3 hours of History.* Technology in American history: the ideological, social, economic, and institutional contexts of technological change from the 1760s to the present. Impacts of new technological systems.

HI 491 Seminar in History. *3(3-0-0) . F,S. Preq: 3 hours of History, Junior standing.* Detailed investigation of selected topics in history. Consult Department of History for specific topics.

HI 495 Honors Research in History I. *2(0-2-0) . F,S. Preq: Senior in History Honors Program.* Preparation of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 496 Honors Research in History II. *4(0-4-0) . F.S. Preq: HI 495, Senior in History Honors Program.* Completion of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 498 Independent Study in History. *1-6. Preq: 3 hours of History.* Extensive readings on predetermined topics focused around a central theme. Permission of the department is required.

HONORS

HON 101 Honors Colloquium I. *1(0-2-0) . F. Preq: UHP student.* Introduction to Honors at NC State University for University Honors Program students. Development of Honors Plan of Study and discussion of issues of concern in higher education and relationship between education, personal development, and community involvement. Require permission of the University Honors Program

HON 102 Honors Colloquium II. *1(0-2-0) . S. Preq: HON 101, UHP student.* Introduction to Honors at NC State University for University Honors Program students. Development of plan for honors research project and proposal for study abroad experience. Further reflection on purpose of higher education in addressing the issues and opportunities of our time. Require permission of the University Honors Program

HON 201 Inquiry, Discovery, and the Arts. *3(3-0-0) . F,S. Preq: UHP student.* A study of works of art that treat the theme of inquiry and discovery-its risks, its creativeness, its ambiguities and complexities, and its moral dilemmas. Selected works from several media-theatre, music, visual arts, and film. Analysis of each work in terms of its historical context and internal structure as well as its treatment of the nature of inquiry and discovery.

HON 202 Inquiry, Discovery, and Literature. *3(3-0-0) . F, S. Preq: UHP student.* A study of works of literature that treats the themes of inquiry and discovery--its risks, its creativeness, its ambiguities and complexities, and its moral dilemmas--through selected works from literature and other media, including theater, music, visual arts, and film. Analysis of each work in terms of its historical context and internal structure as well as its treatment of the nature of inquiry and discovery.

HON 290 Honors Special Topics - History. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in History, interdisciplinary in character and often team-taught.

HON 291 Honors Special Topics-Mathematics. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in mathematics, interdisciplinary in character and often team-taught.

HON 292 Honors Special Topics-Natural Sciences. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the natural sciences, interdisciplinary in character and often team-taught.

HON 293 Honors Special Topics-Literature. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in history or literature, interdisciplinary in character, and often team-taught.

HON 294 Honors Special Topics-Philosophy or Religion. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in philosophy, religion, or arts, interdisciplinary in character, and often team-taught.

HON 295 Honors Special Topics-Social Science. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the social sciences, interdisciplinary in character, and often team-taught.

HON 296 Honors Special Topics-Science, Technology, Society-H&SS Perspective. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Science, Technology and Society (humanistic perspective) interdisciplinary in character and often team-taught.

HON 297 Honors Special Topics-Science, Technology, Society-Natural Sciences. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Science, Technology and Society (natural science perspective) interdisciplinary in character and often team-taught.

HON 298 Honors Research/Independent Study. *1-3. F,S,Sum.* Research/independent Study for University Honors Program students. Repeatable if content differs. Research or independent study under supervision of faculty members. Project approval by the Honors Program Advisory Committee necessary prior to registration. Permission of the University Honors Program required

HON 299 Honors Special Topics - Visual and Performing Arts. *3(3-0-0) . F,S. Preq: UHP student.* Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Visual and Performing Arts, interdisciplinary in character and often team-taught.

HON 321 The Physics of Music. *3(3-0-0) . F. Preq: PY 205 or PY 131 or PY 211, UHP student.* This course explores the physics of sound and musical instruments, approaching such questions as: what differentiates music from other sounds; how are musical sounds produced, controlled, and added together all in search of making music; how instruments evolved and work; what are scales and temperaments; why sounds may be musical to one person and not another? Concepts will be explained in both mathematical and non-mathematical terms. Targeted at science and engineering students.

HON 341 Time Travel. *3(3-0-0) . S. Preq: UHP student.* A study of contemporary metaphysics organized around the topic of time travel. David Lewis, perhaps the foremost contemporary metaphysician, argues that time travel is possible. His argument is based on ingenious positions about three central topics of metaphysics, personal-identity, causation, and free will. Students will consider each of these topics in some detail, always with an eye to their implications for time travel.

HON 342 Issues in Contemporary Religion. *3(3-0-0) . S. Preq: UHP student.* An examination of major issues in contemporary religious thought, with particular attention to how theologians have reshaped traditional theological concepts in response to 20th-21st century challenges. After considering the academic study of religion and addressing the methodological issues of the nature of religious language and the task of theology, the course will examine the impact of recent historical and cultural developments on the formulation of theological proposals and the role religion plays in shaping societal attitudes and mores.

HON 343 Philosophical Ethics. *3(3-0-0) . F.* An introduction to some of the main concepts and theories in the field of ethics. This course explores answers to the most basic questions of ethics: How can we tell right from wrong and good from bad? What is it to be a good person? What does $making the world a better place$ amount to? The course will examine how philosophers have answered these questions in the past and consider how their answers might be relevant to contemporary ethical dilemmas. University Honor Program Students or permission of UHP.

HON 351 American Ideals in Global Perspective. *3(0-0-0) . F.* This course will examine core American ideals, how they evolved, what differentiates them from competing ideologies, and the extent to which they are transferable to countries with very different cultures, histories, and levels of economic development. It will also critically enquire about the extent to which the United States has been achieving its ideals and how successful it has been in promoting these values globally.

HON 371 Environmental Science and Technology. *3(3-0-0) . S.* This seminar explores deeply advanced topics in contemporary environmental science and considers and evaluates the potential solutions to the challenges they pose. The seminar is based on readings from multiple perspectives of these real-world challenges with an emphasis on those occurring in North Carolina. The seminar is interdisciplinary, so political, economic, and ethical aspects are addressed. University Honors Program student or permission of UHP.

HON 391 Music and Social Life. *3(3-0-0) . S.* At NC State and in the Triangle people are actively engaged in music-making, dancing, devotional practices, and a multitude of other kinds of artful performance. Students in this class think about the relationship between music and other aspects of social life by doing field research to answer questions about creativity, listening, performance, and the ways music and dance shape social life, values, and ideas about difference. Students consider modes of research about music and learn techniques for doing ethnographic research. Must be a University Honors Program student or have permission of the UHP.

HON 395 Honors Cooperative Education. *3(3-0-0) . F,S. Preq: Two semester full time in University Honors Program.* Experimental work in government or industry for Honors Program students with two semesters completed in Honors. Typically students work 40 hrs/week with salary. Work supervisor, faculty adviser and Honors Program Director must sign HON 395 Honors Cooperative Ed contract. NC State cooperative Education requires paper work; student must pay fee rate for a 0-5 credit hour course. No other courses permitted along with HON 395. Student report of the independent project is required.

HON 397 Honors Extension and Engagement. *1-6. F,S,Sum. Preq: One semester good standing in University Honors Program.* Opportunity for significant hands-on involvement in extension and engagement research/project as mentored by NC County Extension employees often in cooperation with community employers/executives, local and government officials, and county citizens. Approved plan of work required with significant independent research/project including a reflective journal, a final paper and presentation at the NC State Undergraduate Research Symposium or a venue appropriate to the discipline. Students must provide their own transportation.

HON 398 Honors Special Topics. *1-6. F,S,Sum. Preq: UHP student.* A seminar or other learning experience within an academic framework that may be on- or off-campus. Enables the development of new HON courses outside the GER list.

HON 496 Honors Capstone Seminar. *3(3-0-0) . F,S. Preq: UHP student.* Honors Seminars open to Juniors and Seniors in all disciplinary Honors Programs, and others with permission of the University Honors Program. Repeatable if content differs. A series of seminars with differing subjects, interdisciplinary in character and sometimes team-taught, allowing advanced students to explore topics from a multidisciplinary perspective and to apply their knowledge to issues and problems in the present world. Permission of the University Honors Program

HON 498 Honors Research/Creative Project 1. *3(3-0-0) . F,S,Sum. Preq: One semester in good standing in University Honors Program, UHP student.* Opportunity for hands-on faculty mentored research/creative project. Course may be stand-alone project completed in one semester/summer, or serve as part of a two semester project that is completed at the end of Honors Research/Creative Project 2 (HON 499). Approved plan of work required with significant independent research/creative project culminating with final paper and presentation at the NC State Undergraduate Research Symposium or other venues appropriate to the discipline. Research within or outside the student's discipline may fulfill experience.

HON 499 Honors Research/Creative Project 2. *3(3-0-0) . F,S,Sum. Preq: One semester in good standing in University Honors Program, UHP student.* Opportunity for hands-on faculty mentored research/creative project. Course serves as final part of a two-semester project that began with Honors Research/Creative Project 1 (HON 498)or approved disciplinary research experience. Approved plan of work required with significant independent research/creative project culminating with final paper and presentation at the NC State Undergraduate Research Symposium or other venues appropriate to the discipline. Research within or outside the student's discipline may fulfill experience.

HORTICULTURAL SCIENCE

HS 100 Home Horticulture. *3(3-0-0) . F,S.* Introduction and review of home horticulture as it relates to the horticultural enthusiast. A general understanding of plant growth, structure, and development; house plant selection and care, selecting trees, shrubs, and flowers for the home landscape, and other related topics.

HS 201 Principles of Horticulture. *3(3-0-0) . F,S.* Principles of plant growth and development relating to production and utilization of fruit, vegetable, floricultural, and ornamental crops. Historical, economic, and global importance of horticultural crops and services.

HS 211 Ornamental Plants I. *3(1-5-0) . F. Preq: BIO 181.* Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes bedding plants, trees, and gymnosperms.

HS 212 Ornamental Plants II. *3(1-5-0) . S. Preq: BIO 181.* Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes shrubs, ground covers, vines, bulbs, and interior landscape plants.

HS (ANS) 215 Basic Agricultural Genetics. *3(3-0-0) . F. Preq: ZO 160, BIO 183 or BIO 125.* Basic principles of inheritance in plants and animals of agricultural significance. Transmission genetics and its effects on the usefulness of plants and animals. Basic principles of plant and animal improvement.

HS 252 Landscape Graphic Communication. *3(1-0-3) . S. Preq: THL Majors or THG Majors.* Visualization of the entire design process, from conception to presentation drawings. A complete graphic vocabulary (concepts, techniques, and drawing styles) will be covered, providing the designer with an effective means of communicating design ideas, to her/himself, other professionals, clients, and the public.

HS 290 Perspectives in Horticultural Science. *1(1-0-0) . F.* Introduction and orientation to programs in horticultural science. Discussion of current status of horticulture, extension and research. Emphasis on undergraduate program management, internships, graduate education, and career planning. Guest lectures, career opportunities and qualifications for employment in horticulture and related fields.

HS 301 Plant Propagation. *4(3-3-0) . F. Preq: BIO 181 or BO 200.* Theoretical basis and techniques for successful asexual and sexual propagation of seed plants and ferns. Influence of heredity, phytopathological infection, and environmental conditions on success and quality of propagules. Recent developments and innovations in propagation techniques and methodologies.

HS 302 Gardening with Herbaceous Perennials. *3(3-0-0) . S, Alt. yrs.(odd). Preq: BIO 183 or BO 200.* Examination of the use of herbaceous perennials in the home garden and commercial landscapes. Topics include: general plant characteristics, culture and management, garden attributes, design usage, horticultural history, propagation, use of exotic (nonnative)species in the garden, heirloom roses and ornamental grasses.

HS 342 Landscape Horticulture. *3(2-3-0) . F,S.* Introduction to comprehensive process for small scale landscape projects. Includes garden history, social and environmental analysis, creative problem solving process and the practice of oral, written and graphic communication.

HS 357 Site Design and Construction Materials. *4(3-3-0) . F, S. Preq: THL Majors, HS 252 and HS 342.* Site design of small scale landscape design projects including: understanding two-dimensional and three-dimensional representation of landform, landform manipulation, surveying and measuring, base map development, site analysis, grading and drainageplans, small circulation systems (pedestrian and vehicular), pavement, functional role of plants, designing site structures (steps, ramps, walls, and fences), documenting and analyzing user information, and special population site requirements. Exploration of appropriate construction materials and their properties occurs concurrently with the above topics. Field trips will be required.

HS 371 Interior Plantscapes. *3(2-3-0) . S. Preq: BIO 181 or BO 200, second semester Sophomore standing.* Identification, selection, installation, utilization, and maintenance of plants commonly used in commercial interior settings.

HS 400 Residential Landscaping. *6(0-9-0) . F,S. Preq: HS 211, 212, 342, LAR 430, Coreq: LAR 457.* Equips students with the necessary skills to create functional, aesthetic, and humanistic designs for residential and other small scale projects. Aspects of problem identification, project organization, design, execution, and evaluation. Required field trip with fee.

HS 401 Landscape Construction Studio. *6(0-9-0) . S. Preq: THL Majors, HS 357, 400.* Small scale landscape design with a concentrated focus on detail design and construction documentation. Development of skills in designing, drawing, and building landscape features. Opportunities for hands-on experiences.

HS 411 Nursery Management. *3(2-3-0) . F. Preq: BIO 181, SSC 200, Junior standing.* Principles and practices of production, management, and marketing of field-grown and container-grown nursery plants. One of three scheduled weekend field trips required at students' expense.

HS 416 Principles of Ornamental Planting Design. *4(2-3-0) . F,S. Preq: THL Majors, HS 400.* Developing and cultivating a design process for creating meaningful and compelling ornamental planting designs through the study and practice of spatial articulation (form, enclosure, permeability), physical properties of plants (line, form, texture, color), client/site analysis and program development, visual journaling, garden narrative, presentation skills, utilizing principles of visual composition, design communication, and understanding and resolving technical and horticultural issues in contemporary planting design.

HS 421 Physiology and Culture of Temperate-Zone Tree Fruits. *3(2-3-0) . F. Preq: BIO 181 or BO 200.* Physiology and culture of the major temperate-zone tree fruit and nut crops of the United States. Fundamental principles underlying woody plant growth as applied to the culture of specific tree-fruit crops with emphasis on crops of commercial importance to North Carolina.

HS 422 Small Fruit Production. *3(2-3-0) . S, Alt. yrs.(even). Preq: BIO 181, SSC 200, HS 201, and Consent of Instructor.* Importance and economic value of blackberries, blueberries, cranberries, grapes, raspberries, strawberries and minor small fruit crops in the agricultural economy of the USA and the world. Cultural requirements of these crops and manipulation of their known morphological and physiological traits for successful production. Six all afternoon field trips are required.

HS 431 Vegetable Production. *4(3-3-0) . F. Preq: BIO 181, SSC 200.* Principles and practices of production and marketing of seventeen vegetable crops grown in the U.S. Additional topics include pest management, seed technology, food safety, sustainable agriculture, use of genetically engineered crops, and consumer issues.

HS 432 Introduction to Permaculture. *3(3-0-0) . F,S.* Permaculture means Spermanent culture,$ (or Spermanent agriculture$) and ...Sis the conscious design and maintenance of cultivated ecosystems that have the diversity, stability, and resilience of a natural ecosystem.$ (Bill Mollison) This course will explore, through lectures, discussions, field trips, and required projects, a design/thinking methodology that seeks to profide for our physical needs, food, water, shelter, energy, etc., while doing so in an environmentally friendly, sustainable manner. The Saturday field trips and the weekend mountain trip are all optional.

HS 440 Greenhouse Management. *3(2-3-0) . F. Preq: SSC 200 and HS 201.* Perspective of greenhouse systems management. Selection of greenhouse site, construction, heating, cooling and production systems. Emphasis on greenhouse operations, cost accounting and analysis. Other topics; root substrates, sanitation, water, fertilization, chemical growth regulation, temperature, light and marketing. Hands-on experience in greenhouse operations plus trips to commercial greenhouses and markets.

HS 442 Production of Floricultural Crops. *3(2-3-0) . S. Preq: SSC 200, HS 201.* Production of floricultural crops. Emphasis on environmental manipulation and scheduling of crop growth and development for targeted market periods. Specific flowering crops as models to demonstrate potted flowering plant, cut flower, and bedding plant production systems. Hands-on crop production experience plus field trips to commercial floriculture production and marketing facilities.

HS 451 Plant Nutrition. *3(3-0-0) . S, Alt. yrs. (even). Preq: SSC 200.* An understanding of the basic mineral nutrient requirements, nutritional monitoring procedures, and fertilizer application methods in horticultural production systems including those for fruits, field vegetables, fruits and vegetables under plasticulture, nursery crops, landscapes, greenhouse flowers and vegetables, interior plantscapes, hydroponics, and organic farming.

HS (FS) 462 Postharvest Physiology. *3(3-0-0) . S. Preq: BO 421.* Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

HS 471 Tree and Grounds Maintenance. *4(3-3-0) . S. Preq: SSC 200.* Principles and practices of tree and grounds maintenance. Physical (water) and chemical (fertility) properties of urban soils. Tree and shrubbery: physiology, selection, transplanting, pruning, fertilization, and protection. Weed biology and nonchemical and chemical management options.

HS 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

HS 493 Special Problems in Horticultural Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

HS 495 Special Topics in Horticultural Science. *1-6. F,S,Sum.* Independent study under faculty supervision of horticultural topics in the student's area of interest not available in regular course offerings. Offering of new courses on a trial basis.

HUMANITIES AND SOCIAL SCIENCES

HSS 100 CHASS Computer Literacy. *0(0-1-0) . F,S. Preq: Departmental designated computer literacy course.* Computer Literacy Certification for majors in College of Humanities and Social Sciences.

HSS 110 Humanities and Social Sciences Scholars Forum. *0(0-0-0) . F,S. Preq: Enrollment limited to participants in the Scholars of the College Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS 111 Humanities and Social Sciences Scholars Forum. *0(0-0-0) . F,S. Preq: Enrollment limited to participants in the Scholars of the College Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

HSS 294 Social Sciences Studied in an Overseas Context. *3(3-0-0) . Sum.* Social Sciences courses taught in NC State Study Abroad programs. (Current listings available in Study Abroad office and CHASS Dean's Office.)

HSS 298 Study Abroad Topics in Humanities and Social Sciences. *1-6. F,S.* Study Abroad Programs: selected topics in the humanities and social sciences.

HSS (COM) 392 International and Crosscultural Communication. *3(3-0-0) . S.* Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics of crosscultural communication. Impact on communication of differing cultural perspectives.

INDUSTRIAL DESIGN

ID (GD) 102 Graphic and Industrial Design Fundamentals. *6(9-2-0) . S. Preq: Design Majors, DF 101.* Introductory studio in fundamental two-dimensional and three-dimensional concepts of graphic and industrial design. Basic design principles and invention of visual and spatial form within contexts relevant to design of communication and products.

ID 201 Basic Industrial Design Studio I. *6(0-9-0) . F. Preq: Design Majors, DF 102. Coreq: ID 255, ID 318, ID 318L.* Introduction to the theories, methods, and language of industrial design; elementary problems in form and function; transitional implications of hand-crafted and mass-produced objects, in various materials.

ID 202 Basic Industrial Design Studio II. *6(0-9-0) . S. Preq: Design Majors, ID 201. Coreq: ID 256, ID 418,ID 418L.* Introduction to the fundamentals of product development and design with emphasis on analytical and intuitive approaches to problem solving, technical skills, manufacturing and structural considerations in design of simple products/systems.

ID 215 Introduction to digital Techniques. *3(3-9-0) . F. Preq: Design Majors.* Introduction to the computer as a design tool for generating and manipulation of two-dimensional raster and vector imagery; techniques in two-dimensional concept rendering; desktop publishing applications for design and production of presentation documentation; and visual editors for creating and managing web sites.

ID 255 Contemporary Manufacturing Processes I. *3(3-9-0) . F.* Introduction to mass production processes and their influences on design. Wood, paper and metal manufacturing processes utilized in quantity production.

Emphasis on materials comparison and process selection in relation to product function, form, safety, human factors and manufacturability. Field trips required.

ID 256 Contemporary Manufacturing Processes II. *3(3-9-0) . S.* Second course in mass production processes and their influences on design. Emphasis on material search and process selection in relation to form, function, human factors, finishes, and joining methods. Plastics and rubber and their specific manufacturing processes utilized in mass production.

ID 262 Professional Practice in Industrial Design. *3(3-9-0) . S. Preq: Design Majors.* Issues and situations encountered in a design practice. Topics include patents, trademarks, contracts, basic marketing skills within corporations and in free-lance design.

ID 292 Special Topics in Industrial Design. *1-3. F,S,Sum.* Topics of current interest in Industrial Design. Normally used to develop new courses.

ID 300 Intermediate Industrial Design Digital Studio Series. *6(0-9-0) . F,S,Sum. Preq: Design Majors, ID 202, ID 315. Coreq: ID 415.* Individual and team-oriented design experiences that expand upon and combine intellectual and manual skills required for the practice of industrial design. Emphasis on identifying and solving design problems through manipulation of design theory, application of human factors, product safety awareness, universal design principles, ecological/environmental concerns, appropriate combination of materials and manufacturing techniques, and presentation of concepts. Extensive integration of computertechnology, including 3-D digital modeling, rapid prototyping, interactive virtual product visualization, and world wide web-based presentation.

ID 315 Digital Product Modeling. *3(3-0-0) . S. Preq: Design Majors, ID 215.* Progression of digital experiences that expand upon and combine the intellectual and conceptual skills required for 3-dimensional design visualization. Emphasis on solving design problems through development and manipulation of 3- dimensional form within the virtual environment.

ID 318 Ideation I. *3(2-2-0) .* The ideation process of conceiving, developing and recording ideas two-dimensionally. These techniques defined and practiced as an extension of understanding the human idea motor process.

ID 400 Advanced Industrial Design Studio Series. *6(0-9-0) . F,S,Sum. Preq: Industrial Design Majors, ID 300.* A series of advanced studio experiences that expands upon and combines intellectual and manual skills required for the practice of industrial design. Emphasis on identifying and solving design problems through manipulation of design theory, application of human factors, product safety awareness, appropriate combination of materials and manufacturing techniques, and presentation of concepts.

ID 415 Advanced Digital Product Modeling. *3(3-0-0) . F,Sum. Preq: Design Majors, ID 215, ID 315.* Advanced concepts for planning and executing efficient workflow practices for manufacturable product surfaces. Emphasis on theory and application of three-dimensional surface modeling tools, accurate development of wire frame geometry, rapid prototyping and animation techniques. Introduction of animations to aid with dynamic visual analysis of digital product design concepts.

ID 418 Ideation II. *3(2-2-0) . S.* This is an advanced course which expands the ideation process with greater emphasis directed toward the creative development and recording of conceptual design phase.

ID 445 Human-Centered Design. *3(3-0-0) . F. Preq: Design Majors.* Introduction to the spectrum of human physical and cognitive capabilities as they relate to user interaction with designed products and environments.

ID 490 Industrial Design International Studio. *6(0-9-0) . F,S,Sum. Preq: Junior standing in ID, College of Design or equivalent program, Approval Study Abroad Office.* Define industrial design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary limited and mass produced products. Focus on artifact making through directed studies.

ID 492 Special Topics in Industrial Design. *1-3. F,S,Sum. Preq: Consent of Instructor.* Topics of current interest in Industrial Design. Normally used to develop new courses.

ID 494 Internship in Industrial Design. *3-6. F,S,Sum. Preq: Junior standing, 3.0 GPA or better.* Supervised field experience in product design offices, galleries, museums and other related organizations. Maximum of 6 credit hours

ID 495 Independent Study in Industrial Design. *1-3. F,S. Preq: Junior standing, 3.0 GPA or better in Industrial Design.* Special projects in industrial design developed under the direction of a faculty member on a tutorial basis. Maximum 6 credit hours - May be repeated

INTERDISCIPLINARY STUDIES

IDS 105 A Systems Approach to the Universe. *3(3-0-0) .* Systems approaches to problems in physical, social, and behavioral sciences and technology. Concepts of general systems (interactions between systems functioning). Emphasis in interdisciplinary problem-solving methods and critical questioning.

IDS 201 Environmental Ethics. *3(3-0-0) . F,S.* Interdisciplinary consideration of ways in which field of study coupled with personal/cultural values contribute towards either solving or compounding environmental problems; provides framework for process of making ethical decisions.

IDS (PEH) 211 Eating through Americean History. *3(3-0-0) . F.* Examination of cultural and scientific forces that have shaped our relationship with food. Science and politics of dietary recommendations. Influence, over time, of economic, social and political conditions on food preparation, preference and nutritional knowledge. Role of religion, family, tradition and personal experience in shaping eating attitudes and behaviors. Roles played only by women in American food culture.

IDS 220 Coastal and Ocean Frontiers. *3(3-0-0) . F.* Interdisciplinary approach to current issues, scientific concepts, management strategies and future trends concerning the coasts and the oceans. Required weekend field trip.

IDS 260 Changing Paradigms of Leadership, Learning, and Service. *4(3-0-2) . F,S.* Interdisciplinary examination of leadership, learning, and service-and their inter-relatedness-in light of the evolving scientific worldview of western civilizations. Service-learning enhanced seminar supports students in connecting course materialand community-based experiences to their personal lives and their roles as citizens. Peer-led reflection sessions, seminars with guests, field-trips, and other enhancement opportunities during required weekly two-hour learning lab; service hours scheduled by students. Serves as training course for students interested in leadership roles in service-learning and civic engagement at NCSU.

IDS 295 Special Topics in Multidisciplinary Studies. *F, S, Sum.* Detailed investigation of an interdisciplinary topic. Topic and mode of study to be determined by faculty member and/or teach team.

IDS (NR) 303 Humans and the Environment. *3(3-0-0) . F, S.* Interactions among human populations in the biophysical system and the environment. Emphasis on current issues, ecological principles and their relationships to basic biophysical processes; considers food, population dynamics, public land and common resources, renewable natural resources, pollution, water resources, energy and non-renewable resources.

IDS 305 Peace in the Global Village. *3(3-0-0) . F.* Examination of peace in multidisciplinary terms-anthropological, psychological, political, philosophical, environmental and religious; consideration of human propensity for cooperation as well as aggressiveness; dialogue-lectures, case studies, workshops and round table presentations on past and present human groupings that succeeded in attaining peace; possibilities for peace in the future.

IDS 401 The Contemporary City: Problems and Prospects. *3(3-0-0) . S. Preq: Sophomore standing.* Interdisciplinary examination of the social and physical characteristics of the contemporary city and problems which cities face. Topics include urban design, social relationships, education, transportation, crime and violence, and urban psychology.Alternative solutions to various urban problems examined.

IDS (TAM) 414 Textiles and Society. *3(3-0-0) . Alt. Yrs.. Preq: Sophomore standing.* Historical and sociological study of the textile and apparel industries since the Middle Ages with emphasis on 1850-present. Changes in industry composition, corporate structure, production technology, work organization, and labor-management relations. Impact on communities, workers, and the environment. Long range trends and implications.

IDS 415 Peruvian Amazon Ecology and Ethnology. *2(2-0-0) . Sum.* A field/lecture course, located on the Amazon, near Iquitos, Peru, is presented by a team of scientists and specialists in ornithology, ecology, entomology, and

anthropology. Coursework is divided into pre-trip readings, onsite field experiences and lectures; and post-trip reflection and application. This course is designed for, but not restricted to precollege teachers and informal educators, e.g., in museums and parks, as a general introduction to tropical systems.

IDS (STS) 490 Interdisciplinary Methods and Issues. *3(3-0-0) . F,S. Preq: Interdisciplinary Studies Self-Design Majors, Senior standing.* Capstone seminar for students in the IDS self-design major. Intensive study of student's area of concentration, leading to a major research paper.

IDS 495 Special Topics in Multidisciplinary Studies. *F,S.* Examination of selected topics of an interdisciplinary nature.

IDS 496 Topics in Film and Interdisciplinary Studies. *3(3-0-0) .* Detailed examination of film within interdisciplinary contexts. Specific topics will vary from semester to semester.

IDS 498 Independent Study in Multidisciplinary Studies. *F, S. Preq: Consent of Instructor.* Independent investigation and discussion of a selected topic of an interdisciplinary nature.

INDUSTRIAL ENGINEERING

IE (TE) 110 Computer-Based Modeling for Engineers. *3(3-0-0) . F,S. Preq: E 115. Coreq: MA 141.* Introductory course in computer-based modeling and programming using Visual Basic for Applications. Emphasis on algorithm development and engineering problem solving. Methodical development of VBA within applications like Microsoft Excel and Access from specifications; documentation, style; control structures; classes and methods; data types and data abstraction; object-oriented programming and design; graphical user interface design. Projects: design problems from electrical, industrial, textile, and financial systems. Functional relationships will be given and programs will be designed and developed from a list of specifications.

IE (GC) 210 Introductory Engineering Graphics for Industrial Engineering. *3(2-2-0) . F,S. Preq: E 115.* Introduction to the graphical representation and solution of 2D and 3D spatial problems. Conventional methods using computer-based tools to graphically describe 2D and 3D objects relevant to the field of IE. Overview of the fundamentals and applications of computer graphics and computer-aided design. Includes practical IE drawing applications.

IE 216 Manufacturing Engineering Practicum. *3(1-5-0) . F,S. Preq: C or better in IE 110. Coreq: IE/GC 210.* Hands-on experimentation for students to learn the capabilities and limitations of basic manufacturing processes. Relationships between product design, quality, manufacturing planning, computer simulation, material handling systems, time and motionstudies, and ergonomics.

IE 311 Engineering Economic Analysis. *3(3-0-0) . F,S. Preq: MA 141.* Engineering and managerial decision making. The theory of interest and its uses. Equivalent annual costs, present worth, internal rates of return, and benefit/cost ratios. Accounting depreciation and its tax effects. Economic lot size and similar cost minimization models. Sensitivity analysis. Cost dichotomies: fixed vs. variable, and incremental vs. sunk, use of accounting data. Replacement theory and economic life. Engineering examples.

IE 316 Manufacturing Engineering I - Processes. *3(2-3-0) . F,S. Preq: MSE 200; IE 216; IE/GC 210.* Analytical study and design of manufacturing engineering with emphasis on mfg. and processes. Addresses the interaction of design, materials, and processing. Laboratory instruction and hands-on experience in metrology, machining, process planning,economic justification, and current mfg. methodologies.

IE 330 Furniture Product Engineering. *3(3-0-0) . Preq: IE 210. Open only to students pursuing BS IE, Furniture Manufacturing Option, Wood Science and Technology, and Industrial Design.* Introduction to use and properties of materials and construction methods used in mass production of furniture. Examines techniques of product engineering and its role in determining product quality and manufacturability. Emphasis on principles of computer-based product development, specification, and performance evaluation.

IE 331 Furniture Manufacturing Processes I. *3(3-1-0) . Preq: IE 330.Open only to students pursuing BS IE, Furniture Manufacturing Option, Wood Science and Technology, and Industrial Design.* Furniture manufacturing technology emphasizing mass production equipment capabilities and capacities. Relationship of product characteristics to machine selection and process planning activities. Introduction to computer-controlled machining and integrated manufacturing systems.

IE 351 Manufacturing Engineering. *3(2-3-0) . F,S. Preq: MAT 201, IE 210.* Analytical study and design of manufacturing engineering and processes. Emphasis on the interaction of design, materials, and processing, on the techniques of metrology, machining, process planning, computer-aided process control, economic justification, and state-of-the-art manufacturing technologies.

IE 352 Work Analysis and Design. *3(2-2-0) . F,S. Preq: C- or better in ST 371; C or better in IE 110.* Work methods and production processes to improve operator effectiveness and reduce production costs. Techniques studied include operation analysis, motion study, value engineering, predetermined time systems, time study and line balancing.

IE 361 Deterministic Models in Industrial Engineering. *3(3-0-0) . F,S. Preq: MA 303 or MA 341 or MA 405. C or better in IE 110.* Introduction to mathematical modeling, analysis techniques, and solution procedures applicable to decision-making problems in a deterministic environment. Linear programming models and algorithms and associated computer codes are emphasized.

IE 401 Stochastic Models in Industrial Engineering. *3(3-0-0) . F,S. Preq: MA 303 or MA 341 or MA 405; C- or better in ST 371; C or better in IE 110.* Introduction to mathematical modeling, analysis, and solution procedures applicable to uncertain (stochastic) production systems. Methodologies covered include probability theory and stochastic processes. Applications relate to design and analysisof problems, capacity planning, inventory control, waiting lines, and system reliability and maintainability.

IE 408 Control of Production and Service Systems. *3(3-0-0) . F,S. Preq: IE 361; C- or better in ST 371.* Planning and control of production and service systems. Production organization flow and inventory control methods: Systems approach.

IE 416 Manufacturing Engineering II - Automation. *3(3-0-0) . F,S. Preq: IE 316.* Integration of design and mfg. through computer aided/automated process planning, concurrent engineering, and rapid prototyping. Fixed and programmable automation in mfg. and service. Autonomous mfg. systems such as computer numerical control (CNC), industrial robotics, automated inspection, electronics manufacturing and assembly.

IE 417 Manufacturing Engineering III - Computer Integrated Manufacturing. *3(3-0-0) . F,S. Preq: IE 316 or IE 331; C or better in IE 110.* Principles, economic justification, implementation, and performance evaluation of Computer Integrated Mfg. (CIM) systems. Fundamentals of group technology and cellular mfg. systems. Automation of information flow supporting the manufacturing operations using transaction processing via database technology. Real-time control of CIM systems including data acquisition, process control, and programmable logic controllers.

IE 430 Furniture Manufacturing Processes II. *3(3-1-0) . Preq: IE 331; C or better in IE 110. Coreq: IE 352.* A survey of furniture manufacturing technology. Emphasis is on operations, production rates, and the integration of many types of equipment into a manufacturing system.

IE 431 Furniture Manufacturing Facilities Design. *3(3-1-0) . Preq: IE 430.* A survey of furniture manufacturing technology. Emphasis is on operations, production rates, and the integration of many types of equipment into a manufacturing system.

IE (CSC) 441 Introduction to Simulation. *3(3-0-0) . F,S. Preq: MA 242, ST 372, C or better in IE 110.* Discrete-event stochastic simulation for the modeling and analysis of systems. Programming of simulation models in a simulation language. Input data analysis, variance reduction techniques, validation and verification, and analysis of simulation output. Random number generators and random variate generation.

IE 443 Quality Design and Control. *3(2-2-0) . F,S. Preq: ST 372.* Statistical methods in quality control. Control charts for variables and attributes. Process capability assessment. Role of experimentation in designing for quality. Total Quality Management. Tools for continuous quality improvement. Quality Function Deployment.

IE 452 Ergonomics. *3(2-2-0) . F,S. Preq: CE 214. Coreq: IE 352.* Worker - machine environment systems, design and evaluation; applications to consumer products tools, equipment and the workplace. Consideration of

anatomical, physiological and psychological capabilities and limitations as related to systems design and human performance. Use of anthropometric data in design of display and control systems. Effects of environmental stress upon work performance, safety, and health.

IE 453 Production System Design. *3(3-0-0) . F,S. Preq: IE 401.* Principles and practice in design of facilities and logistics networks. Integration of supply chain design, capacity planning, facility layout, material handling, and storage and warehousing issues into overall production system design. Emphasis on economic justification of alternative designs and use of computer software to aid design process. Group projects.

IE 495 Project Work in Industrial Engineering. *1-6. F,S. Preq: Junior standing.* Special investigations, study or research related to the field of industrial engineering. In a given semester several students and/or student groups may be working in widely divergent areas under the direction of several members of the faculty.

IE 498 Senior Design Project. *3(3-0-0) . F,S. Preq: IE 311, IE 408, IE 441, IE 453.* Individual or group design projects requiring problem definition and analysis, synthesis, specification and presentation of a designed solution. Students work under faculty supervision either on actual industrial engineering problems posed by local industrial, service and governmental organization or on emerging research issues.

INTERNATIONAL STUDIES

IS 393 International Affairs Seminar. *3(3-0-0) . F.* An intensive study of selected international issues, global dimensions and implications, leading to a major research paper.

IS 491 Senior Seminar in International Studies. *3(3-0-0) . S. Preq: IS 393.* An inter-disciplinary study of various aspects of globalization, with an emphasis on the interaction between local communities and global forces and how the two shape each other at the level of human rights, ethnic relations, states, human migrations, the environment, cultures and languages, and health.

LANDSCAPE ARCHITECTURE

LAR 102 Landscape Architecture Design Fundamentals Studio. *6(9-2-0) . S.* Introductory design studio for students in the department of Landscape Architecture. Emphasis on increasing awareness, understanding, and appreciation of the context in which we fit our human-made objects, i.e. the environment. Examination of the specific nature of places, human manipulation of natural and human-made elements, and the consequences of such manipulation. Field trips may be included with a maximum pass through charge totaling $25.00.

LAR 200 Landscape Architecture Introductory Studio. *6(0-9-0) . F. Preq: Design Majors, LAR 102.* Small scale landscape architectural design. Site observation exercises and visits, physical design projects, reading and discussion. Basic skills in landscape architecture, discerning the environmental issues in design, understanding design process, drawing and verbally communicating issues, and idea conceptualization and realization.

LAR 210 Digital Drawing for Landscape Architecture. *3(2-3-0) . S,Sum.* Digital modeling and computer-aided design in landscape architecture. Integration of digital data in visualization of past, existing and future designs.

LAR 211 Digital Design Media for Landscape Architecture. *3(2-3-0) . F,Sum.* Principles and practices related to the use of digital applications in landscape architectural design. Includes two-dimensional raster imaging, vector graphics, photo simulation, and three-dimensional modeling.

LAR 221 Introduction to Environment and Behavior for Designers. *3(3-0-0) . F.* Integration of behavioral and environmental systems related to design. Exploration of humane, ecologically sound design alternatives.

LAR 222 Perception and Behavior for Designers. *3(3-0-0) . S.* Perceptual systems, linkages among them, and linkages between them and language and culture as these affect the design process.

LAR 292 Special Topics in Landscape Architecture. *1-3. F,S,Sum. Preq: Consent of Instructor.* Topics of current interest in Landscape Architecture. Normally used to develop new courses.

LAR 400 Landscape Architecture Studio. *6(0-9-0) . F,S. Preq: DF 102.* Projects cover small scale design, urban landscapes, community design, and environmental management. Design process stressed, including attention to project organization, design synthesis and realization.

LAR 421 Environmental Cognition for Designers. *3(3-0-0) . F.* Basic cognitive theory as a framework for exploration of cognitive imagery; images of self; and developmental images of home, school, neighborhood, and city.

LAR 423 Concepts of Space. *3(3-0-0) .* The role of space and its representation in design is considered against an overview of concepts of space drawn from psychology, anthropology, mathematics, art history, and philosophy.

LAR 430 Site Planning. *3(2-3-0) . F. Preq: MEA 101/110 or MEA 120/130 or SSC 200.* Technical operations and environmental landscape controls for site development. Site analysis, grading and drainage, earthwork, horizontal and vertical control for road alignment. Graphic exercises.

LAR 433 Native Plants in Environmental Design. *3(2-3-0) . S.* Analysis of natural processes relating to plant materials native to this region. Planting design theory. Planting design methods. Applications in a laboratory setting.

LAR 443 Landscape History. *3(3-0-0) .* Human impact on the land over the past 20,000 years: development of agriculture, commerce and industry and their role in changing the face of the earth.

LAR 444 History of Landscape Architecture. *3(3-0-0) . F.* The history of designed landscapes. Environmental, social and cultural factors which influence human made landscapes presented with history and art of landscape architecture.

LAR 445 American Parks, Parkways and Estates. *3(3-0-0) . S. Preq: Junior standing.* Design and planning traditions of parks and parkways. Philosophical and social motivation for establishment of national parks. Field trip to Biltmore Estate and Blue Ridge Parkway.

LAR 457 Landscape Construction Materials, Methods and Documentation. *3(2-3-0) . S. Preq: LAR 430.* Materials, standards, and construction methods used to implement landscape architectural designs. Development of construction documents.

LAR 465 Landscape Architecture International Studio. *6(6-0-0) . Sum. Preq: Junior standing in the College of Design and approval of the International Study Abroad Office.* Define landscape architectural problems and develop design solutions in an international setting. Exercises and projects related to design, culture and the physical environment of the host country. Focus on landscape architecture, gardens and urbanism studied through sketching and documentation, discussion, site investigation, historical context, current design examples and design applications.

LAR 492 Special Topics in Landscape Architecture. *1-3. F,S,Sum. Preq: Consent of Instructor.* Topics of current interest in Landscape Architecture. Normally used to develop new courses.

LAR 494 Internship in Landscape Architecture. *1-3. F,S,Sum. Preq: Junior standing in Landscape Architecture; 3.0 GPA or better.* Supervised field experience in landscape architecture office, related design office, or governmental agency. Students work in an office or agency for up to 12 hours per week. A daily work journal and a final paper summarizing the work experience are required.

LAR 495 Independent Study in Landscape Architecture. *1-3. F,S,Sum. Preq: Junior standing in Landscape Architecture 3.0 GPA or better.* Individual projects in landscape architecture developed under the direction of a faculty member on a tutorial basis.

LATIN

LAT 101 Elementary Latin I. *3(3-0-0) . F.* Beginning course in Classical Latin, emphasizing elementary grammatical form and basic syntax. Readings based on brief selections from Roman authors, including Cicero and Catullus.

LAT 102 Elementary Latin II. *3(3-0-0) . S.* Continuation of Latin 101. Completion of the study of elementary grammar. Readings from a variety of Latin authors, including texts on mythological themes.

LAT 201 Intermediate Latin I. *3(3-0-0) . F. Preq: LAT 102.* Introduction to Latin prose and poetry. Emphasis on increased reading skill. Review of grammar fundamentals and exposure to new and more complex syntax. Examination of cultural significance of readings.

LAT 202 Intermediate Latin II. *3(3-0-0) . S. Preq: LAT 201.* Lyric poetry of Catullus and Horace emphasizing vocabulary, syntax, and techniques of Latin verse. Traditions and the evolution of lyric poetry and the social role of the Roman poet.

LAT (GRK) 310 Classical Mythology. *3(3-0-0) . F.* Greek and Roman mythology through the writings and art of the Classical period. Discussion of creation stories, the major gods and heroes, the underworld and afterlife. Intellectual religious and educational role of myth and of the most important theories of interpretation and classification. All readings and discussion in English.

LOGIC

LOG 201 Logic. *3(3-0-0)* . Introduction to methods of deductive inference. Concepts of inconsistency and entailment. Truth Functional Statement Logic and Quantifier and Predicate Logic. Representation of logically significant form of statements and arguments. Procedures todiscover and notation to write down proofs.

LOG (MA) 335 Symbolic Logic. *3(3-0-0) . F. Preq: LOG 201 or MA 225.* Introduction to modern symbolic logic; the concept of proof, mathematical induction, recursion and the relationship between formal and informal theories (examples: group theory, Peano arithmetic). The G=del Theorems and the mathematical study of logic.

LOG 435 Advanced Logic & Metamathematics. *3(3-0-0) . S. Preq: LOG 335.* Advanced topics in logic and metamathematics: proof procedures, first-order theories, soundness and completeness theorems, recursive functions, the formalization of arithmetic, the Goedel Incompleteness Theorems. Emphasis on mathematical study of logic and mathematics. can not receive credit for both LOG 435 and LOG 535

MANAGEMENT

M 100 Introduction to College of Management. *1(1-0-0) . F,S.* College of Management requirements and expectations, career paths in business, and services available in the College and University. Recognition of the relationships among various functional areas of business education. Examination of fundamental educational issues and vocational strategies.

M 200 Microcomputer Applications for Business and Accounting. *1(0-2-0) . F,S,Sum. Preq: Accounting, Business Management, Economics, and Agricultural and Resource Economics Majors.* Use of microcomputers in business. Applications and exercises using operating system, word processing, and spreadsheet software for specific business problems. Integration of software packages to prepare business reports.

MATHEMATICS

MA 100 Precalculus by Self Study. *3(0-7-0) . Preq: Algebra I.* Directed self study of precalculus topics to prepare students for a Mathematics Level II C Achievement Test in order to qualify for placement into the appropriate calculus course at NC STATE. Enrollment is limited to students who have not received credit for a calculus course or higher at NC State.

MA 101 Intermediate Algebra. 4*(5-0-0) . F,S,Sum.* Preparation for MA 103, MA 105, MA 107, MA 111, and MA 114. Reviews main topics from high school Algebra I and Algebra II emphasizing functions and problem solving. Other concepts and skills covered include algebraic operations, factoring, linear equations, graphs, exponents, radicals, complex numbers, quadratic equations, radical equations, inequalities, systems of equations, compound inequalities, absolute value in equations and inequalities. MA 101 may not be counted as credit toward meeting graduation. Credit for MA 101 is not allowed if student has prior credit in any other mathematical course.

MA 103 Topics in Contemporary Mathematics. *3(3-0-0) . F,S,Sum. Preq: MA 101 or equivalent completed in high school.* Primarily for students in Humanities and Social Sciences. Illustrations of contemporary uses of mathematics, varying from semester to semester, frequently including sets and logic, counting procedures, probability, modular arithmetic, and game theory.

MA 105 Mathematics of Finance. *3(3-0-0) . F,S,Sum. Preq: MA 101 or equivalent completed in high school.* Simple and compound interest, annuities and their application to amortization and sinking fund problems, installment buying, calculation of premiums of life annuities and life insurance.

MA 107 Precalculus I. *3(3-1-0) . F,S,Sum. Preq: Placement via Achievement Test or MA 101..* Algebra and basic trigonometry; polynomial, rational, exponential, logarithmic and trigonometric functions and their graphs. Credit for MA 107 does not count toward graduation for students in Engineering, PAMS, Design, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, College of Management, and B.S. degrees in CHASS. Credit is not allowed for both MA 107 and MA 111

MA 108 Precalculus II. *3(3-1-0) . F,S,Sum. Preq: C or better in MA requirement.* Algebra, analytic geometry and trigonometry; inequalities, conic sections, complex numbers, sequences and series, solving triangles, polar coordinates, and applications.Credit for MA 108 does not count toward graduation for students in Engineering, PAMS, Design, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, College of Management, and B.S. degrees in CHASS. 107. Credit is not allowed for both MA 108 and MA 111. Also, MA 108 should not be counted toward the GER mathematical sciences.

MA 111 Precalculus Algebra and Trigonometry. *3(3-1-0) . F,S,Sum. Preq: Placement via Level Two Achievement Test or MA 101. Cr.* Real numbers, functions and their graphs (special attention to polynomial, rational, exponential, logarithmic, and trigonometric functions), analytic trigonometry. edit in MA 111 does not count toward graduation for students in Engr., Physical & Math. Sci., Design, Biological & Ag. Engr. (Science Program), Biological Sci.(all options),Math. Edu., Forestry, & Textiles. Credit is not allowed for both MA 111 and either MA 107 or MA 108.

MA 114 Introduction to Finite Mathematics with Applications. *3(3-0-0) . F,S,Sum. Preq: MA 101.* Elementary matrix algebra including arithmetic operations, inverses, and systems of equations; introduction to linear programming including simplex method; sets and counting techniques, elementary probability including conditional probability; Markov chains; applications in the behavioral, managerial and biological sciences. Computer use for completion of assignments.

MA 116 Introduction to Scientific Programming (Math). *3(3-0-0) . S. Preq: MA or AMA Majors, MA 141, and either PMS 100 or E 115.* Computer-based mathematical problem solving and simulation techniques using MATLAB. Emphasizes scientific programming constructs that utilize good practices in code development, including documentation and style. Covers user-defined functions, data abstractions, data visualization and appropriate use of pre-defined functions. Applications are from science and engineering.

MA 121 Elements of Calculus. *3(3-0-0) . F,S,Sum. Preq: MA 107 or 111 or placement via Level Two Achievement Test.* For students who require only a single semester of calculus. Emphasis on concepts and applications of calculus, along with basic skills. Algebra review, functions, graphs, limits, derivatives, integrals, logarithmic and exponential functions, functions of several variables, applications in management, applications in biological and social sciences. Credit is not allowed in more than one of MA 121, 131, 141. MA 121 may not be substituted for MA 131 or MA 141 as a curricular requirement

MA 131 Calculus for Life and Management Sciences A. *3(3-0-0) . F,S,Sum. Preq: C or better in MA 107 or MA 111 or placement via Level Two Achievement Test.* First order finite difference models; derivatives - limits, power rule, graphing, and optimization; exponential and logarithmic functions - growth and decay models; integrals - computation, area, total change; applications in life, management, and social sciences. Credit not allowed for more than one of MA 121, 131, and 141

MA 132 Computational Mathematics for Life and Management Sciences. *1(1-0-0) . S. Preq: C or better in MA 121 or MA 131.* Computational aspects of calculus for the life and management sciences; use of spreadsheets and a computer algebra system; applications to data models, differential equation models, and optimization.

MA 141 Calculus I. *4(4-0-0) . F,S,Sum. Preq: MA 111 with grade of C or better or placement via Level Two Achievement Test.* First of three semesters in a calculus sequence for science and engineering majors. Functions, graphs, limits, derivatives, rules of differentiation, definite integrals, fundamental theorem of calculus, applications of derivatives and integrals. Use of computation tools. Credit is not allowed for more than one of MA 141), 131, 121

MA 225 Foundations of Advanced Mathematics. *3(3-0-0) . F,S. Preq: MA 241.* Introduction to mathematical proof with focus on properties of the real number system. Elementary symbolic logic, mathematical induction, algebra of sets, relations, functions, countability. Algebraic and completeness properties of the reals.

MA 231 Calculus for Life and Management Sciences B. *3(3-0-0) . F,S,Sum. Preq: MA 131.* Differential equations - population growth, flow processes, finance and investment models, systems; functions of several variables - partial derivatives, optimization, least squares, multiple integrals; Lagrange multiplier method - chain rule, gradient; Taylor polynomials and series; numerical methods. MA 121 is not an accepted prerequisite for MA 231.

MA 241 Calculus II. *4(3-2-0) . F,S,Sum. Preq: MA 141 with grade of C or better.* Second of three semesters in a calculus sequence for science and engineering majors. Techniques and applications of integration, elementary differential equations, sequences, series, power series, and Taylor's Theorem. Use of computational tools.

MA 242 Calculus III. *4(3-2-0) . F,S,Sum. Preq: MA 241 with grade of C or better.* Third of three semesters in a calculus sequence for science and engineering majors. Vectors, vector algebra, and vector functions. Functions of several variables, partial derivatives, gradients, directional derivatives, maxima and minima. Multiple integration. Line and surface integrals, Green's Theorem, Divergence Theorems, Stokes' Theorem, and applications. Use of computational tools.

MA 293 Special Topics in Mathematics. *1-6. F,S,Sum. Preq: Departmental approval required.* Freshman-sophomore level experimental course offerings or directed individual study.

MA 301 Introduction to Differential Equations. *3(3-0-0) . Preq: Credit for 12 hours of calculus.* First order differential equations with applications; second order linear differential equations with applications in mechanics and other areas elementary matrix algebra, systems of linear equations and applications; Laplace transforms; Fourier series. Credit not allowed if MA 241 taken previously at NCSU. Primarily intended for transfer students whose calculus backgrounds do not include a study of first and second order linear differential equations.

MA 302 Numerical Applications to Differential Equations. *1(1-0-0) . F,S. Preq: MA 241.* Numerical methods for approximating solutions for differential equations, with an emphasis on Runge-Kutta-Fehlberg methods with stepsize control. Applications to population, economic, orbital and mechanical models.

MA 303 Linear Analysis. *3(3-0-0) . F,S. Preq: MA 241.* Linear difference equations of first and second order, compound interest and amortization. Matrices and systems of linear equations, eigenvalues, diagonalization, systems of difference and differential equations, transform methods, population problems. Credit not allowed if credit has been obtained for MA 301, 341 or 405

MA 305 Elementary Linear Algebra. *3(3-0-0) . F, S, Sum. Preq: MA 241 (with corequisite MA 242) or MA 231 and MA 132. Coreq: MA 242 (with prerequisite MA 241).* An elementary introduction to the essentials of linear algebra. Matrices and systems of linear equations, determinants, euclidean spaces as vector spaces, linear transformations of euclidean spaces, elementary treatment of eigenvalues and eigenvectors, applications to numerical solutions of equations and computer graphics. Credit is not allowed for both MA 305 and MA 405

MA 308 College Geometry. *3(3-0-0) . Preq: MA 225.* The axiomatic approach to mathematics. Congruences for triangles. Parallel postulate and consequences. Right triangles. Circles, tangents, chords. Area. Coordinate geometry. Lines and planes in space. Non-Euclidean geometries.

MA 325 Introduction to Applied Mathematics. *3(3-0-0) . S. Preq: MA 231 or MA 242.* Introduces students with multivariable calculus to five different areas of applied mathematics. These areas will be five three-week modules, which lead to higher level courses in the application areas. Topics will vary, and examples of modules areheat and mass transfer, biology and population, probability and finance, acoustic models, cryptography as well as others.

MA (LOG) 335 Symbolic Logic. *3(3-0-0) . F. Preq: LOG 201 or MA 225.* Introduction to modern symbolic logic; the concept of proof, mathematical induction, recursion and the relationship between formal and informal theories (examples: group theory, Peano arithmetic). The Gödel Theorems and the mathematical study of logic.

MA 341 Applied Differential Equations I. *3(3-0-0) . F, S, Sum. Preq: MA 242 or (MA 132 and MA 231).* Differential equations and systems of differential equations. Methods for solving ordinary differential equations including Laplace transforms, phase plane analysis, and numerical methods. Matrix techniques for systems of linear ordinary differential equations. Credit is not allowed for both MA 301 and MA 341

MA 351 Introduction to Discrete Mathematical Models. *3(3-0-0) . F,S. Preq: MA 224, 225, 231 or 241.* Basic concepts of discrete mathematics, including graph theory, Markov chains, game theory; with emphasis on applications; problems and models from areas such as traffic flow, genetics, population growth, economics, and ecosystem analysis.

MA 401 Applied Differential Equations II. *3(3-0-0) . F,S,Sum. Preq: MA 341 or 301.* Wave, heat and Laplace equations. Solutions by separation of variables and expansion in Fourier Series or other appropriate orthogonal sets. Sturm-Liouville problems. Introduction to methods for solving some classical partial differential equations.Use of power series as a tool in solving ordinary differential equations. Credit for both MA 401 and MA 501 will not be given

MA 402 Computational Mathematics: Models, Methods and Analysis. *3(3-0-0) . F. Preq: Fortran or C or Pascal, Physics.* Introduction to high performance computing and numerical modeling. Matrix models and boundary value problems with an emphasis on heat and mass transfer. Assessments of all approximations in the computational engineering and science process.

MA 403 Introduction to Modern Algebra. *3(3-0-0) . F,S,Sum. Preq: MA 225.* Sets and mappings, equivalence relations, rings, integral domains, ordered integral domains, ring of integers. Other topics selected from fields, polynomial rings, real and complex numbers, groups, permutation groups, ideals, and quotient rings. Credit is not allowed for both MA 403 and MA 407

MA 405 Introduction to Linear Algebra and Matrices. *3(3-0-0) . F,S,Sum. Preq: MA 241. Coreq: MA 242.* Linear equations operations with matrices, row echelon form, determinants, vector spaces, linear independence, bases, dimension, orthogonality, eigenvalues, reduction of matrices to diagonal forms, applications to differential equations and quadratic forms. Credit is not allowed for both MA 305 and MA 405

MA 407 Introduction to Modern Algebra for Mathematics Majors. *3(3-0-0) . Preq: MA* 225 Elementary number theory, equivalence relations, groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, rings, polynomial rings, quotient fields, principal ideal domains, Euclidean domains. Credit is not allowed for both MA 403 and MA 407

MA 408 Foundations of Euclidean Geometry. *3(3-0-0) . F,S. Coreq: MA 403 or MA 407.* An examination of Euclidean geometry from a modern perspective. The axiomatic approach with alternative possibilities explored using models.

MA 410 Theory of Numbers. *3(3-0-0) . S. Preq: One year of calculus.* Arithmetic properties of integers. Congruences, arithmetic functions, diophantine equations. Other topics chosen from quadratic residues, the quadratic reciprocity Law of Gauss, primitive roots, and algebraic number fields.

MA (ST) 412 Long-Term Actuarial Models. *3(3-0-0) . F. Preq: MA 241 or MA 231. Coreq: MA 421, BUS(ST) 350, ST 301, ST 311, ST 361, ST 370, ST 371, ST 380 or equivalent.* Long-term probability models for risk management systems. Theory and applications of compound interest, probability distributions of failure time random variables, present value models of future contingent cash flows, applications to insurance, health care, credit risk, environmental risk, consumer behavior and warranties.

MA (ST) 413 Short-Term Actuarial Models. *3(3-0-0) . S. Preq: MA 241 or MA 231, and one of MA 421, ST 301, ST 370, ST 371, ST 380, ST 421..* Short-term probability models for risk management systems. Frequency distributions, loss distributions, the individual risk model, the collective risk model, stochastic process models of solvency requirements, applications to insurance and businessdecisions.

MA (CSC) 416 Introduction to Combinatorics. *3(3-0-0) . S, Alt. yrs. Preq: MA 242 or CSC 224, and proficiency in a programming language.* Basic principles of counting: addition and multiplication principles, generating functions, recursive methods, inclusion-exclusion, pigeonhole principle; basic concepts of graph theory: graphs, digraphs, connectedness, trees; additional topics from:Polya theory of counting, Ramsey theory; combinatorial optimization - matching and covering, minimum spanning trees, minimum distance, maximum flow; sieves; mobius inversion; partitions; Gaussian numbers and q-analogues; bijections and involutions; partially ordered sets.

MA 421 Introduction to Probability. *3(3-0-0) . F,S,Sum. Preq: MA 242.* Axioms of probability, conditional probability and independence, basic combinatorics, discrete and continuous random variables, joint densities and mass functions, expectation, central, limit theorem, simple stochastic processes.

MA 425 Mathematical Analysis I. *3(3-0-1) . F,S. Preq: MA 225 (MA 407 desirable).* Real number system, functions and limits, topology on the real line, continuity, differential and integral calculus for functions of one variable. Infinite series, uniform convergence. Credit is not allowed for both MA 425 and MA 511.

MA 426 Mathematical Analysis II. *3(3-0-0) . S. Preq: MA 425 and 405.* Calculus of several variables, topology in n-dimensions, limits, continuity, differentiability, implicit functions, integration.

MA (CSC) 427 Introduction to Numerical Analysis I. *3(3-0-0) . F. Preq: MA 341 or 301 and programming language efficiency.* Theory and practice of computational procedures including approximation of functions by interpolating polynomials, numerical differentiation and integration, and solution of ordinary differential equations including both initial value and boundary value problems. Computer applications and techniques.

MA (CSC) 428 Introduction to Numerical Analysis II. *3(3-0-0) . S. Preq: MA 405 and programming language proficiency..* Computational procedures including direct and iterative solution of linear and nonlinear equations, matrices and eigenvalue calculations, function approximation by least squares, smoothing functions, and minimax approximations.

MA 430 Mathematical Models in the Physical Sciences. *3(3-0-0) . F. Preq: MA 341 or 301; and MA 405.* Application of mathematical techniques to topics in the physical sciences. Problems from such areas as conservative and dissipative dynamics, calculus of variations, control theory, and crystallography.

MA 432 Mathematical Models in Life and Social Sciences. *3(3-0-0) . S. Preq: MA 301 or 341, 305 or 405., programming language proficiency. Coreq: MA 421 or ST 371.* Topics from differential and difference equations, probability, and matrix algebra applied to formulation and analysis of mathematical models in biological and social science (e.g., population growth).

MA 433 History of Mathematics. *3(3-0-0) . F,S. Preq: One year of calculus.* Development of mathematical thought and evolution of mathematical ideas examined in a historical setting. Biographical and historical content supplemented and reinforced by study of techniques and procedures used in earlier eras.

MA 435 Major Topics in the Development of Mathematics. *3(3-0-0) . Preq: MA 242. Coreq: MA 403 or MA 407 or MA 425.* Great themes in mathematics, in their cultural and historical framework from an advanced undergraduate mathematical viewpoint. Biographical/mathematical snapshots of famous mathematicians.

MA 437 Applications of Algebra. *3(3-0-0) . S. Preq: MA 403 or 407, MA 405.* Error correcting codes, cryptography, crystallography, enumeration techniques, exact solutions of linear equations, and block designs.

MA 440 Game Theory. *3(3-0-0) . F. Preq: MA 231 or MA 242.* Game Theory as a language for modeling situations involving conflict and cooperation in the social, behavioral, economic, and biological sciences. Backward induction; dominated strategies; Nash equilibria; games with incomplete information; repeated games; evolutionary dynamics.

MA 444 Problem Solving Strategies for Competitions. *1(1-0-0) . F.* Analyze the most common problem-solving techniques and illustrate their use by interesting examples from past Putnam and Virginia Tech math competitions. Problem solving methods are divided into groups and taught by professors of the math department. After the lecture, students practice writing the solutions for the assignment and have informal discussions in the next class.

MA 491 Reading in Honors Mathematics. *2-6. F,S. Preq: Membership in honors program, Departmental approval required.* A reading (independent study) course available as an elective for students participating in the mathematics honors program.

MA 493 Special Topics in Mathematics. *1-6. F,S. Preq: Departmental approval required.* Directed individual study or experimental course offerings.

MA 494 Major Paper in Math. *1(0-1-0) . F, S. Preq: Departmental approval required. Coreq: MA class at the 400-level or above.* Introduces students to one or more forms of writing used in scientific and research environments. Students are required to take a companion math course at the 400-level or above, and adapt writing assignment(s) to the topics in the companion course.Instruction covers all phases of the writing process (planning, drafting, revising, and critiquing other people's work). Emphasis is placed on organizing for needs of a variety of readers; concise, clear expression.

MA 499 Independent Research in Mathematics. *1-6. F,S,Sum. Coreq: MA 491H.* Study and research in mathematics. Topics for theoretical, modeling or computational investigation. Consent of Department Head. Honors Program should enroll in MA 491H. At most 6 hours total of MA 499 and 491H credit can be applied towards an undergraduate degree.

MECHANICAL AND AEROSPACE ENGINEERING

MAE 206 Engineering Statics. *3(3-0-0) . F,S,Sum. Preq: 2.3 GPA, PY 205. Coreq: MA 242.* Basic concepts of forces in equilibrium. Distributed forces, frictional forces. Inertial properties. Application to machines, structures, and systems.

MAE 208 Engineering Dynamics. *3(3-0-0) . F,S,Sum. Preq: 2.3 GPA, MA 242, C- or better in MAE 206 or CE 214.* Kinematics and kinetics of particles in rectangular, cylindrical, and curvilinear coordinate systems; energy and momentum methods for particles; kinetics of systems of particles; kinematics and kinetics of rigid bodies in two and three dimensions; motion relative to rotating coordinate systems.

MAE 261 Aerospace Vehicle Performance. *3(3-0-0) . S,Sum. Preq: CSC 112, MA 241, PY 205.* Introduction to the problem of performance analysis in aerospace engineering. Aircraft performance in gliding, climbing, level, and turning flight. Calculation of vehicle take-off and landing distance, range and endurance. Elementary performance design problems.

MAE 301 Engineering Thermodynamics I. *3(3-0-0) . F,S,Sum. Preq: MA 242, PY 208 or 202.* Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the First and Second Law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles is introduced.

MAE 302 Engineering Thermodynamics II. *3(3-0-0) . F,S,Sum. Preq: CSC 112 or CSC 114, C- or better in MAE 301.* Continuation of Engineering Thermodynamics I with emphasis on the analysis of power and refrigeration cycles and the application of basic principles to engineering problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, chemical reactions, combustion, chemical equilibrium cycle analysis, and one-dimensional compressible flow.

MAE 304 Manufacturing Laboratory. *1(0-3-0) . F,S. Preq: Sophomore standing in ME, C or better in MAE 206, GC 211.* This laboratory course teaches several modern-manufacturing processes. Interaction between manufacturing and design is emphasized. Students learn techniques in operating manual and numerically controlled manufacturing machines. Students learn about other metallic and nonmetallic manufacturing processes. Safe operation of equipment is taught and students are expected to perform the labs in a safe manner. Students will not become certified machinists or CNC operators.

MAE 305 Mechanical Engineering Laboratory I. *1(0-3-0) . F,Sum. Preq: Junior standing in ME.* Theory and practice of measurement and experimental data collection. Laboratory evaluation and demonstration of components of the generalized measurement system and their effects on the final result. Applications of basic methods of data analysis aswell as basic instrumentation

for sensing, conditioning and displaying experimental qualities. (Instruction and practice in technical report writing.)

MAE 306 Mechanical Engineering Laboratory II. *1(0-3-0) . S,Sum. Preq: MAE 305. Coreq: MAE 310.* Continuation of MAE 305 into specific types of measurements. Students evaluate and compare different types of instrumentation for measuring the same physical quantity on the basis of cost, time required, accuracy, etc. (Oral and written presentation of technical material).

MAE 308 Fluid Mechanics. *3(3-0-0) . F,S,Sum. Preq: MA 242, CSC 112 or CSC 114, C- or better in MAE 208 or CE 215. Coreq: MA 341, MAE 301.* Development of the basic equations of fluid mechanics in general and specialized form. Application to a variety of topics including fluid statics; inviscid, incompressible fluid flow; design of Fluid dynamic system.

MAE 310 Heat Transfer Fundamentals. *3(3-0-0) . F,S,Sum. Preq: CSC 112 or CSC 114, MA 341, C- or better in MAE 301. Coreq: MAE 308.* Analysis of steady state and transient one and multidimensional heat conduction employing both analytical methods and numerical techniques. Integration of principles and concepts of thermodynamics and fluid mechanics to the development of practicalconvective heat transfer relations relevant to mechanical engineers. Heat transfer by the mechanism of radiation heat transfer.

MAE 314 Solid Mechanics. *3(3-0-0) . F,S,Sum, Preq: MA 242, C- or better in MAE 206 or CE 214. Coreq: MSE 200 or MSE 201.* Concepts and theories of internal force, stress, strain, and strength of structural element under static loading conditions. Constitutive behavior for linear elastic structures. Deflection and stress analysis procedures for bars, beams, and shafts.Introduction to matrix analysis of structures.

MAE 315 Dynamics of Machines. *3(3-0-0) . F,S,Sum. Preq: ME or AE Majors; MAE 208 with a grade of C or better; CSC 112. Coreq: MA 341.* Application of dynamics to the analysis and design of machine and mechanical components. Motions resulting from applied loads, and the forces required to produce specified motions. Introduction to mechanical vibration, free and forced response of discrete and continuous systems.

MAE 316 Strength of Mechanical Components. *3(3-0-0) . F,S,Sum. Preq: ME, AE, or NE Majors, CSC 112 or CSC 114; C- or better in MAE 314. Coreq: MA 341.* Analysis and design of mechanical components based on deflection, material, static strength and fatigue requirements. Typical components include beams, shafts, pressure vessels and bolted and welded joints. Classical and modern analysis and design techniques. Computer analysis using the finite element method. Material and manufacturing considerations in design.

MAE 355 Aerodynamics I. *3(3-0-0) . F. Preq: MAE 261, MA 341.* Fundamentals of perfect fluid theory with applications to incompressible flows over airfoils, wings, and flight vehicle configurations.

MAE 356 Aerodynamics II. *3(3-0-0) . S. Preq: MAE 355 and a grade of C or better in MAE 301.* Concepts of thermodynamics, compressible fluid flow, and shock waves with application to computing the aerodynamic characteristics of airfoils, wings and flight configurations at high speed.

MAE 357 Experimental Aerodynamics I. *1(0-3-0) . F. Preq: MAE 261, MA 341. Coreq: MAE 355.* Subsonic wind tunnel, instrumentation, data acquisition techniques, technical report preparation. Experiments involve pressure and force/moment measurements of various aerospace vehicle components with supplemental flow visualization.

MAE 358 Experimental Aerodynamics II. *1(0-3-0) . S. Preq: MAE 357. Coreq: MAE 356.* Advanced stability and control experiments in the subsonic wind tunnel and external compressible flow experiments in the supersonic wind tunnel.

MAE 371 Aerospace Structures I. *3(3-0-0) . F. Preq: MAE 261, MAE 314 with a grade of C or better.* Determination of appropriate analysis techniques for Aerospace Structures. Introduction of governing equations and selected solutions for typical structures. Use of these concepts in the design of a representative structural component.

MAE 403 Air Conditioning. *3(3-0-0) . S. Preq: MAE 302, MAE 310, MAE 308.* Design of a complete air conditioning system for a building. Introduction, Design Objectives - Building Description, Review of Psychrometrics and Air Conditioning Processes, Cooling and Heating Load Calculation, Space Air diffusion, Duct Lay-out and Design, Equipment Selection, Pipe Sizing, Life-cycle Cost Analysis.

MAE 404 Refrigeration. *3(3-0-0) . S. Preq: MAE 302, MAE 308, MAE 310.* Thermodynamic analysis of the vapor compression cycle; optimization of multiple evaporator and multiple compressor systems; commercial refrigeration load calculations; desirable properties of refrigerants and brines, piping arrangement and sizing.

MAE 405 Mechanical Engineering Laboratory III. *1(0-3-0) . F,S. Preq: MAE 306.* Final undergraduate course in mechanical engineering laboratory sequence. Experimental investigation of measurement problems involving typical mechanical engineering equipment systems. Design and application of a measurement system to a specific problem.

MAE 406 Energy Conservation in Industry. *3(3-0-0) . F. Preq: MAE 302, MAE 310.* Application of energy conservation principles to a broad range of industrial situations with emphasis on typical equipment encountered as well as the effect of recent environmental regulations. Topics covered include: steam generators, pollution control, work minimization, heat recovery, steam traps, industrial ventilation, electrical energy management, and economics. Field trip to conduct tests and evaluate operation at three NCSU steam plants.

MAE 407 Steam and Gas Turbines. *3(3-0-0) . S. Preq: MAE 302; MAE 308 or MAE 355.* Fundamental analysis of the theory and design of turbomachinery flow passages; control and performance of turbomachinery; gas-turbine engine processes.

MAE 408 Internal Combustion Engine Fundamentals. *3(3-0-0) . F. Preq: MAE 302.* Fundamentals common to internal combustion engine cycles of operation. Otto engine: carburetion, combustion, knock, exhaust emissions and engine characteristics. Diesel engine: fuel metering, combustion, knock, and performance. Conventional and alternative fuels used in internal combustion engines.

MAE 410 Convective Heat Transfer and Fluid Flow. *3(3-0-0) . F,S,Sum. Preq: MAE 301, MAE 308. Coreq: MAE 310.* Integration of principles and concepts of thermodynamics, fluid mechanics, and heat transfer to the development of practical convective heat transfer and mass transport relations relevant to mechanical engineering. Typical applications include boilers, condensors, piping, pumps, and heat exchangers.

MAE 411 Machine Component Design. *3(3-0-0) . F. Preq: MAE 315, MAE 316.* Application of the principles of solid mechanics and material science to the analysis and design of specific machine components including screws, bearings, gears, transmission devices, brakes, clutches, couplings, fly wheels, cams, etc.

MAE 412 Design of Thermal System. *3(3-0-0) . F,S. Preq: MAE 302, MAE 308, MAE 310.* Applications of thermodynamics, fluid mechanics, and heat transfer to thermal systems with an emphasis on system design and optimization. Design of heat exchangers. Analysis of engineering economics, including time value of money, present and future worth, payback period, internal rates of return, and cost benefit analysis. Review of component model for pipes, pumps, fans, compressors, turbines, evaporators, condensers and refrigerators. Simulation methods for finding the operating point for thermal systems. Design of thermal systems through methods of optimization.

MAE 415 Analysis for Mechanical Engineering Design. *3(3-0-0) . F,S. Preq: MAE 302, MAE 308, MAE 315, MAE 316.* Integration of the physical sciences, mathematics, and engineering to solve real-world design problems. Emphasis on open-ended problems which contain superfluous information and/or insufficient data. Solution techniques focus on problem definition,reduction to a solvable system, and development of a design response. Formal written communication of results.

MAE 416 Mechanical Engineering Design. *4(2-6-0) . F,S. Preq: MAE 415.* Teamwork, independent learning and communication skills are emphasized in this capstone course. Teams of students experience mechanical engineering design through: problem definition, investigation, brainstorming, focus, critical review, design, analysis, prototype construction and testing. Design for manufacture is encouraged throughout the process by having students build their own prototypes. Communication skills are developed through reports and presentations.

MAE 421 Design of Solar Thermal Systems. *3(3-0-0) . S. Preq: MAE 302, MAE 310. Coreq: MAE 410.* Analysis and design of active and passive solar thermal systems for residential and small commercial buildings. Solar insulation, flat plate collectors, thermal storage, heat exchanges, controls, design, performance calculations, economics. Site evaluation, shading,

suncharts, types of passive systems. Heating load analysis. Overview of photovoltaics. On-site evaluation of NCSU Solar House.

MAE 435 Principles of Automatic Control. *3(3-0-0) . F,S,Sum. Preq: MA 341, MAE 315.* Study of linear feedback control systems using transfer functions. Transient and steady state responses. Stability and dynamic analyses using time response and frequency response techniques. Compensation methods. Classical control theory techniquesfor determination and modification of the dynamic response of a system. Synthesis and design applications to typical mechanical engineering control systems. Introduction to modern control theory.

MAE 442 Automotive Engineering. *3(3-0-0) . S. Preq: MAE 302, MAE 308, MAE 315, MAE 316.* Fundamental aspects of automotive engineering. Examines various automotive systems (engine, brakes, etc.) as well as their interactions in such areas as safety and performance. Current practices and development for the future.

MAE 452 Aerodynamics of V/STOL Vehicles. *3(3-0-0) . S. Preq: MAE 356.* Introduction to the aerodynamics and performance of vertical and short take-off and landing vehicles. Aerodynamics of propellers and rotors. High lift devices.

MAE 453 Introduction to Space Flight. *3(3-0-0) . S. Preq: PY 205; MA 341 or MA 303.* Fundamental aspects of space flight including launch vehicle performance and design, spacecraft characteristics, two-body orbital mechanics, earth satellites, interplanetary trajectories, atmospheric entry, and atmospheric heating.

MAE 455 Boundary Layer Theory. *3(3-0-0) . F. Preq: MAE 355.* Introduction to the Navier-Stokes Equations and boundary layer approximations for incompressible flow. Calculation techniques for laminar and turbulent boundary layer parameters which affect lift, drag, and heat transfer on aerospace vehicles. Discussions of compressible flows.

MAE 456 Computational Methods in Aerodynamics. *3(3-0-0) . F, Alt yrs. Preq: MAE 356. Coreq: MAE 455.* Introduction to computational methods for solving exact fluid equations. Emphasis on development of the fundamentals of finite difference methods and their application to viscous and inviscid flows.

MAE 461 Dynamics & Controls. *3(3-0-0) . F. Preq: MA 341, MAE 208 with a grade of C or better.* Dynamics and linear feedback control of aerospace and mechanical systems. Concepts from linear system theory, kinematics, particle dynamics, first- and second-order systems, system dynamics, vibrations, and computational techniques. Feedback controlby root-locus, Nyquist, Bode plots, servo-mechanisms, gain and phase margin, and compensation. Control system design emphasized.

MAE 462 Flight Vehicle Stability and Control. *3(3-0-0) . S. Preq: MAE 261, 461.* Longitudinal, directional and lateral static stability and control of aerospace vehicles. Linearalized dynamic analysis of the motion of a six degree-of-freedom flight vehicle in response to control inputs and disturbance through use of the transfer function concept. Control of static and dynamic behavior by vehicle design (stability derivatives) and/or flight control systems.

MAE 465 Propulsion II. *3(3-0-0) . F. Preq: MAE 365.* Performance analysis and design of components and complete air-breathing propulsion systems.

MAE 466 Experimental Aerodynamics III. *1(0-3-0) . F. Preq: MAE 358. Coreq: MAE 455, MAE 475.* Laboratory experiments in internal compressible flow and boundary layers in conjunction with MAE 455 and MAE 475. Topics include nozzle flows, constant area duct flows, component/overall performance of a gas turbine, and boundary layer analysis.

MAE 469 Controls Laboratory. *1(0-2-0) . F. Coreq: MAE 461 or MAE 435.* Laboratory experiments demonstrate the essential features of classical and modern control theory for single-input and single-output systems.

MAE 472 Aerospace Structures II. *3(3-0-0) . S. Preq: MAE 371.* A continuation of MAE 371; deflection of structures, indeterminate structures, minimum weight design fatigue analysis and use of matrix methods in structural analysis. Selection of materials for aircraft construction based on mechanical, physical, and chemical properties.

MAE 473 Aerospace Vehicle Structures II Lab. *1(0-3-0) . S. Preq: MAE 371. Coreq: MAE 472.* Demonstration and application of the concepts that have been presented in MAE 371 and MAE 472. Fabrication techniques and the design and construction of a structural component will be emphasized.

MAE 475 Propulsion. *3(3-0-0) . F. Preq: MAE 356 and MAE 301.* One-dimensional, internal, compressible flow including: isentropic flow, normal shocks, flow with friction and simple heat addition. Applications to air-breathing aircraft propulsion systems. Performance, analysis and design of components and overall performance of air-breathing engines.

MAE 476 Rocket Propulsion. *3(3-0-0) . F. Preq: MAE 356 or MAE 302.* Study of chemical rockets. This includes nozzle theory, flight performance, thermochemical calculations, and component and system analysis and design.

MAE 478 Aerospace Vehicle Design I. *3(1-6-0) . F. Preq: Senior standing, Aerospace Engineering Majors, MAE 356, 472, 462.* A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

MAE 479 Aerospace Vehicle Design II. *4(1-9-0) . S. Preq: MAE 478.* Designs are refined and the vehicles constructed and instrumented by the students. A flight test program is designed and carried out in cooperation with MAE 525 students. A continuation of MAE 478

MAE 495 Special Topics in Mechanical and Aerospace Engineering. *1-3. Preq: Consent of Instructor.* Offered as needed to present new or special MAE subject matter.

MAE 496 Undergraduate project Work in Mechanical and Aerospace Engineering. *1-6. F,S,Sum. Preq: Completion of all required MAE-300 level courses. Coreq: MAE 415 or MAE 478.* Individual or small group project in engineering, comprising the design of an equipment or system stemming from a mutual student-faculty interest; a substantial final report (project) containing calculations, drawings and specifications must be produced. Alternatively, individual or small group undergraduate research evolving from a mutual student-faculty interest; a conference or scientific journal paper must be submitted for publication. Departmental approval required

MICROBIOLOGY

MB 103 Introductory Topics in Microbiology. *1(1-0-0) . S.* Introduction to scope and objectives of university education. Emphasis on microbiology. Career opportunities, computers, university resources.

MB 200 Microbiology and World Affairs. *3(3-0-0) .* An integrated and comprehensive study of the microbial world and its influence on global events and human affairs.

MB 351 General Microbiology. *3(3-0-0) . F,S,Sum. Preq: One biology course: (BIO 125,BIO 181, 183, ZO 150, or ZO 160) and one organic chemistry course: (CH 221 or CH 220).* Rigorous introduction to basic principles of microbiology for students in biological and agricultural sciences and for all students planning to take further courses in microbiology.

MB 352 General Microbiology Laboratory. *1(0-3-0) . F,S,Sum. Coreq: MB 351.* Laboratory experience in general microbiology. Aseptic technique, isolation and identification of bacteria, staining and microscopy. Enumeration of bacteria and viruses.

MB (FS) 405 Food Microbiology. *3(3-0-0) . Preq: MB 351.* Microorganisms of importance in foods and their metabolic activities. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes.

MB (FS) 406 Food Microbiology Lab. *1(0-2-1) . Coreq: FS (MB) 405.* Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.

MB 409 Microbial Diversity. *3(2-3-0) . S. Preq: MB 351.* Molecular, biochemical and evolutionary diversity of the microbial world, including Bacteria (a.k.a. eubacteria), Archaea (archaebacteria), and unicellular Eucarya (eucaryotes). Evolutionary perspective on microbial relationships, molecular

methodsof study, and classical and modern biotechnological methods utilizing this genetic diversity to meet the needs of our own species.

MB 411 Medical Microbiology. *3(3-0-0) . F. Preq: MB 351.* Comprehensive study of microbial pathogenesis and mammalian host resistance. Diagnosis, prevention, and therapy of common human diseases of microbial origin.

MB 412 Medical Microbiology Laboratory. *1(0-3-0) . F. Preq: MB 351.* Laboratory experience to complement MB 411. Techniques of detection, growth and identification of bacteria and viruses relevant in clinical microbiology laboratories. Good laboratory practices (GLP) and safety stressed.

MB 414 Microbial Metabolic Regulation. *3(3-0-0) . F. Preq: MB 351, BCH 451.* An integrative perspective on bacterial physiology and metabolism through an analysis of metabolic regulatory functions.

MB 441 Immunology. *3(3-0-0) . F. Preq: MB 351.* Introduction to principles of molecular immunology. Overview of immune system development and function, and discussions of ongoing scientific research regarding immune regulation.

MB 451 Microbial Diversity. *4(3-3-0) . S. Preq: SMB Majors, MB 411/412 and either GN 411 or BCH 451.* Molecular, biochemical and evolutionary diversity of the microbial world, including Bacteria (a.k.a. eubacteria), Archaea (archaebacteria), and unicellular Eucarya (eukaryotes). Evolutionary perspective on microbial relationships, molecular methodsof study and classical and modern biotechnological methods utilizing this genetic diversity to meet the needs of our own species.

MB 455 Microbial Biotechnology. *3(3-0-0) . S. Preq: MB 351, GN 411.* Introduction to industrial microbiology with focus on biotechnology including developments employing recombinant nucleic acid and monoclonal antibody techniques. Bioremediation, industrial enzymes, transgenic plants, biopesticides, medical diagnostics, recombinant vaccines production of important secondary metabolites, and other topics. Field trips to local biotechnology companies.

MB 461 Introduction to Molecular Virology. *3(3-0-0) . S. Preq: MB 351, MB 411.* Introduction to principles of molecular virology. Overview of classification and nomenclature, virus structure, interaction of viruses with cells, organisms (immunology, pathology), and populations (epidemiology). Detailed case studies from major groups of viruses; picornaviruses, togaviruses, orthomyxoviruses, retroviruses, polyomaviruses, and herpesviruses.

MB 490 Seminar in Microbiology. *1(1-0-0) . F,S. Preq: MB 351 and Senior standing.* Library research on current topics in all areas of microbiology. Presentation of research results orally and in the form of a major term paper.

MB 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

MB 493 Special Problems in Microbiology. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

MB 495 Special Topics in Microbiology. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

MARINE, EARTH, AND ATMOSPHERIC SCIENCES

MEA 100 Earth System Science: Exploring the Connections. *4(3-2-0) . S. Preq: Competence in high school algebra and chemistry.* An introduction to the processes of and linkages among major components of planet Earth. Geosphere, hydrosphere, atmosphere, biosphere as dynamic and interdependent systems. Influence of human activity on earth systems. Optional weekend field trip.

MEA 101 Geology I: Physical. *3(3-0-0) . F,S,Sum. Coreq: Recommended that MEA 110 be taken concurrently.* Systematic consideration of processes operating on and below the earth's surface and the resulting features of landscape, earth structures, and earth materials. Occurrences and utilization of the earth's physical resources.

MEA 110 Geology I Laboratory. *1(0-3-0) . F,S,Sum. Coreq: MEA 101.* Scientific methodology applied to the study of common rock-forming minerals, common rocks, topographic maps, geologic structures and geological maps. Field trips.

MEA 120 The Dinosaurian World. *3(3-0-0) . F.* Evolution and ecology of dinosaurs related to broader features of Earth history, including plate tectonics, paleoclimatology, mass extinction and the long-term effects of natural selection.

MEA 121 The Dinosaurian World Lab. *1(0-2-0) . F. Coreq: MEA 120.* Companion to lecture course on SThe Dinosaurian World.S. Adaptive significance of osteological characteristics, ecological correlates of body weight and physical environmental variables, and concepts relating to natural selection, fitness, biodiversity and changes in the planetary environment on various time scales. Discussion, specimen demonstrations and problem solving.

MEA 130 Introduction to Weather and Climate. *3(3-0-0) . F,S. Preq: For Non-Majors.* Explores the structure, physical causes, and climatology of weather systems including the jet streams, mid-latitude cyclones, hurricanes, thunderstorms, and tornadoes. Clouds and precipitation, air pollution, climate modification, optical effects (rainbows, halos) and weather instruments. Weather systems and forecasting techniques are illustrated through daily weather map discussions.

MEA 135 Introduction to Weather and Climate Laboratory. *1(0-2-0) . F,S. Coreq: MEA 130.* Experiments include effects of air pressure change on temperature and density (gas law); measurement of atmospheric moisture; formation of clouds and hail; effects of variable solar heating. Graphical display and interpretation of data; weather instruments and observations; weather map analysis; forecasting principles.

MEA 140 Natural Hazards and Global Change. *3(3-0-0) .* The science of natural hazards and global change: the impact on human civilization of events in the lithosphere, atmosphere, biosphere, and hydrosphere (e.g., earthquakes, hurricanes, red tides, and floods), and the impact of humans on the global environment (e.g., global warming).

MEA 150 Environmental Issues in Water Resources. *4(3-3-0) . F.* The science of current environmental concerns, particularly those related to water resources. Major topics include weather and climate, natural resource cycles, resource depletion and contamination, societal impacts. Scientific aspects of environmental issues. Required field trips.

MEA 200 Introduction to Oceanography. *3(3-0-0) . F,S. Preq: High school physics, chemistry, algebra, trigonometry and biology.* The ocean as a part of our environment including interactions between atmosphere and ocean, ocean circulation, physical and chemical properties of sea water, marine geology and marine biology.

MEA 202 Geology II: Historical. *3(3-0-0) . S. Preq: MEA 101. Coreq: Recommended that MEA 211 be taken concurrently.* The second semester of the basic introductory sequence in geology. Utilization of the principles of geology to reconstruct and understand the earth's history. Geologic events that cause modification of the earth's crust, emphasizing North America. History of life and the environmental significance of changes in animal and plant life through geologic time.

MEA 210 Oceanography Lab. *1(0-3-0) . F,S. Coreq: MEA 200.* Complements the lecture course in Oceanography. Numerous demonstrations and resource materials visualize basic oceanographic concepts such as geological processes operating in the marine realm, the chemical properties of seawater, oceanic circulation, tides and waves, as well as processes affecting the biology of the oceans.

MEA 211 Geology II Laboratory. *1(0-2-0) . Coreq: MEA 202.* Reconstruction and interpretation of events in the history of the earth. Interpretation of sedimentary rocks, construction and interpretation of geological maps, identification of fossil organisms and utilization of fossils in the reconstruction of earth history.

MEA 213 Fundamentals of Meteorology. *2(1-2-0) . F. Coreq: MA 141.* Introduction to the discipline of and opportunities in meteorology, atmospheric vertical structure, motion, and pressure systems, jet streams; global circulation; air masses and fronts; mid-latitude cyclone structure and evolution.

MEA 214 Fundamentals of Meteorology II. *2(1-2-0) . S. Preq: MEA 213.* Introduction to moisture variables, adiabatic processes, thermodynamic diagrams, stability, clouds and precipitation, thunderstorms, tornadoes, and hurricanes, air pollution, global climate change, ozone hole.

MEA (ZO) 220 Marine Biology. *3(3-0-0) . S. Preq: MEA 200 or BIO 181.* Introduction to marine plants and animals, their adaptations to life in the sea and ecological interactions in selected marine environments (e.g. coral reefs, deep sea, salt marshes). Interactions of man with the sea: food from the seas, biology of diving. Optional trip.

MEA 250 Introduction to Coastal Environments. *3(3-0-0) . Preq: MEA 200/210 or MEA 101/110.* A global survey of coastal habitats, the processes that shape these dynamic environments, and the physicochemical controls that regulate their indigenous biological communities.

MEA 251 Introduction to Coastal Environments Laboratory. *1(0-2-0) . Coreq: MEA 250.* Complements the lecture course Introduction to Coastal Environments (MEA 250). Experiments involving the physical, chemical and biological processes that shape a variety of coastal environments.

MEA 268 Marine Paleontology. *4(3-2-0) . F. Preq: BIO 181, MEA 102.* Evolution of marine life traced through geologic time, accenting the functional significance of adaptations and the history of marine ecosystems. Required field trips.

MEA 300 Environmental Geology. *4(3-3-0) . Preq: MEA 101 or MEA 150 or MEA 140 or SSC 200.* Geologic aspects of the environment. Effects of humans upon or interactions with geologic processes. Geologic considerations in land use planning, waste disposal, water resources, and natural resources. A field and lab oriented course with combined lecture/laboratory. Inquiry-based learning approach to study the basic processes of environmental geology and develop research skills. Required field trips.

MEA 311 The Global Atmosphere. *3(3-0-0) . F. Preq: PY 205 or 211 & MA 141. Coreq: MEA 213 & 313.* Physical basis for weather and climate. Regional and global climate change; earth-sun relationships; solar energy incident to and modified by the atmosphere; terrestrial radiation; transports of heat and water vapor; surface and global energy balance; general circulation of the atmosphere; climate classification.

MEA 312 Atmospheric Thermodynamics. *3(3-0-0) . S. Preq: PY 208; MEA 311. Coreq: MA 241, MEA 214 & 314.* Atmospheric thermodynamics: equation of state for mixture of gases; first and second laws of thermodynamics; diabatic and adiabatic processes for dry and moist air; measurement and phase changes of water vapor. Atmospheric statics: static stabilityof moist air; vertical acceleration.

MEA 313 Weather Measurements and Analysis I. *1(0-3-0) . F. Coreq: MEA 213 & 311.* A laboratory course supplementing material in MEA 311. Solar and terrestrial radiation; atmospheric attenuation; surface energy balance; general circulation and transport of heat and water vapor; climate classification.

MEA 314 Weather Measurements and Analysis II. *1(0-3-0) . S. Preq: MEA 311. Coreq: MEA 214 & 312.* A laboratory course supplementing material in MEA 312. Meteorological data fields and their mathematical expression; objective analysis; measurement and calculation of moisture variables: moist and dry adiabatic processes; static stability; effects of radiation and vertical motion; vertical cross sections.

MEA (ET) 320 Fundamentals of Air Pollution. *4(3-3-0) . S. Preq: MA 121 or MA 131 or MA 141, CH 201, PY 131 or PY 201 or PY 205 or PY 211.* Air pollution sources, and the influence of natural and anthropogaric processes on the atmosphere. Roles of local, state and federal governments in air pollution control and importance of the Clean Air Act and it amendments. Techniques for measurement of atmosphere pollutant concentrations and determination of local and regional air quality. Required field trips may extend beyond class time.

MEA (CH) 323 Earth System Chemistry. *3(3-0-0) . S. Preq: CH 201. Coreq: BIO 181 or any MEA course.* Chemistry of the earth with an emphasis on the interactions of the biosphere, geosphere and atmosphere. The origin and chemical evolution of the solar system, chemical cycles in the environment, and the impact of man on biogeochemical processes.

MEA 369 Terrestrial Paleontology. *4(3-2-0) . S. Alt yrs(odd). Preq: BIO 181, MEA 102.* Evolution of terrestrial life traced through geologic time, accenting the functional significance of adaptations and the history of terrestrial ecosystems. Required field trips.

MEA 384 Paleoecology. *3(3-0-0) . F, Alt yrs(odd). Preq: MEA 268 and MEA 369.* Methodologies in paleoecology. Effects of preservational bias, interpretations of the dynamics of ancient communities, and comparisons with living communities. Required field trips.

MEA 400 Earth Systems Simulation Modeling. *4(3-3-0) . S. Preq: Senior standing ES,NR,MEA Majors.* Conceptual ecosystems modeling, dynamics, parameterization, boundary conditions, data integration, validation, interactions between sub-systems, and anthropogenic-coupling. Construction of simulation models using programmable blocks for quantitative simulations. Develop modeling skills and illustrate simulations of science and management questions through focus on a watershed-river-coastal system (Neuse River-Pamlico Sound)

MEA 405 Climatological Data Analysis. *3(3-0-0) . S. Preq: MEA 311 and ST 380.* Probability and statistics applied to climatology and meteorology. Discrete and continuous probability distributions of meteorological variables examined. Regression analysis applied to weather forecasting. Forecast verification. Smoothing and filtering processes. Introduction to time series analysis. Elementary decision theory.

MEA 410 Introduction to Mineralogy and Petrology. *4(3-3-0) . F. Preq: MEA 101, CH 101/102.* Introduction to the fundamentals of mineralogy, optical mineralogy, and igneous and metamorphic petrology. Description and identification of minerals, using physical properties and geological associations. Optical properties of non-opaque rock-forming minerals, emphasizing petrographic thin sections. Introduction to igneous and metamorphic environments and rocks. Description and classification of common crystalline rocks. Required overnight field trips; additional expenses required.

MEA 411 Marine Sediment Transport. *3(3-0-0) . F. Preq: MEA 101 or MEA 200, MA 241, PY 201 or PY 205.* Quantitative study of sediment transport in the marine environment including an introduction to fluid mechanics and sediment transport theory. Discussion of the processes and products of sediment transport in specific marine environments from estuaries to the deep sea and interpretation of sediment transport processes from sedimentary structures. Credit not allowed for both MEA 411 and MEA 562

MEA 412 Atmospheric Physics. *3(3-0-0) . S. Preq: MA 242, PY 208.* Physical and analytical descriptions of atmospheric aerosols, clouds/fogs, and precipitation processes; size distribution and sources of atmospheric aerosols; impact of aerosols on visibility and climate; microstructure of warm and cold clouds and their interaction with solar and terrestrial radiation; collision-coalescence and ice phase mechanisms of precipitation formation; atmospheric electricity; planned and inadvertent weather modification; weather radar; atmospheric optics.

MEA 415 Geology of Economic Mineral Deposits. *3(2-3-0) . S,Alt yrs. Preq: MEA 410, MEA 440 and 450 recommended.* The nature, geologic setting and geographic distribution of economic mineral deposits. Topics include both metallic and industrial minerals and the various geologic processes that work to produce them. Laboratory work with economic mineral suites from famous mining districts of the world. Two to three weekend field trips required.

MEA 417 Geology of Fossil Fuel Deposits. *3(3-0-0) . Preq: MEA 410 or MEA 450, MEA 451, PY 211 or PY 205.* Introduction to applications of geological and geophysical principles in the exploration, evaluation and exploitation of the earth's fossil energy resources.

MEA 421 Atmospheric Dynamics I. *3(3-1-0) . F. Preq: MA 242, PY 208, MEA 312, MEA 314.* Meteorological applications of fluid kinematics: divergence, vorticity, deformation, advection, mass continuity and vertical motion. Atmospheric dynamics: the equation of motion on a rotating earth; component equations in Cartesian, polar-spherical and pressure coordinates. Scale analysis and simplifications. Cases of horizontal flow: geostrophic and gradient wind, ageostrophy and acceleration; thermal wind and vorticity.

MEA 422 Atmospheric Dynamics II. *3(3-1-0) . S. Preq: MEA 421.* Vorticity and potential vorticity equations; dynamics of synoptic-scale motions; quasi-geostrophic theory; atmospheric waves including shallow water, internal gravity, inertia-gravity, and Rossby waves; finite difference methods; numerical

weather prediction; atmospheric instabilities including static, Kelvin-Helmholtz, inertial, symmetric, barotropic, and baroclinic instabilities.

MEA 430 Scientific Concepts and Global Problems. *3(3-0-0) . F,S. Preq: Sophomore standing.* Major problems facing human population caused by conflict between its growth, its consumption and the earth's finite environment. Focus on scientific concepts and dynamics governing these problems, their interrelationships, their causes, and their consequences. Participatory learning through group discussions and student-initiated research.

MEA 433 Forensic Geology. *4(3-2-0) . S. Preq: MEA 101.* Application of geology to crime investigation, ranging from violent crime to fraud and liability in property management. Role of a geologist as expert witness. Application of analytical techniques, e.g., petrographic microscopy, trace-element analysis, remote sensing, digital mapping, and image analysis. Tour of the SBI lab and a certified gemology lab. Identification of art fraud by pigment analysis and a corresponding tour of the NC Museum of Art.

MEA (CE) 435 Engineering Geology. *3(3-0-0) . S. Preq: MEA 101 and Junior standing in Colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences or Textiles.* Application of both geology and geotechnical engineering to engineering projects. Illustrations of relevant materials properties and techniques utilized in describing subsurface conditions.

MEA 440 Igneous and Metamorphic Petrology. *4(3-3-0) . S. Preq: MEA 410.* The study of rocks formed by the crystallization of magmas (igneous) and by the recrystallization of existing rocks (metamorphic), with emphasis on whole-rock and mineral compositions, classification, petrography, hand-sample and thin-section identification, and the rock origins in terms of magma genesis and emplacement and tectonics. Field trips are required.

MEA 443 Weather Analysis and Forecasting I. *4(1-3-2) . F. Preq: MEA 421.* Analysis and forecasting of mid-latitude weather systems with emphasis on simplified models and methods. Barotropic model, Rossby waves; baroclinic structure, upper-level wave evolution, forecasting; surface cyclone evolution, Sutcliffe-Petterssen model. Numerical computation methods; numerical weather prediction and operational models, subjective and objective analysis of meteorological fields.

MEA 444 Weather Analysis and Forecasting II. *4(3-3-1) . S. Preq: MEA 443.* Analysis and forecasting of mid-latitude weather systems with emphasis on simplified models and methods. Barotropic model, Rossby waves, baroclinic structure, upper-level wave evolution, forecasting; surface cyclone evolution, Sutcliffe-Petterssen model. Numerical computation methods, numerical weather prediction and operational models, subjective and objective analysis of meteorological fields.

MEA (ZO) 449 Principles of Biological Oceanography. *3(3-0-0) . F. Preq: BIO 181.* Biological productivity and trophic relationships in plankton, nekton and benthos; community ecology of selected habitats (estuaries, intertidal zones, coral reefs, deep sea); and adaptation of organisms to the marine environment. Credit is not allowed for both MEA(ZO)449 and MEA(ZO)549

MEA 450 Introductory Sedimentary Petrology/Stratigraphy. *4(3-3-0) . S. Preq: MEA 410.* Properties, classification, geologic occurrences, and origin of minerals and rocks formed by physical, chemical, and biologic processes at and near the earth's surface. Principles of division of stratified terrains into natural units, correlation of strata, interpretation of depositional environments and facies. Required field trips.

MEA 451 Structural Geology. *4(3-3-0) . F. Preq: MEA 410.* Basic principles of geometric, kinematic and dynamic analysis as applied to fractures, shear zones, folds, and fabrics of deformed rock bodies. Considers both brittle and ductile realms of the crust from microscale to regional tectonics. Required overnight field trips.

MEA 454 Marine Physical-Biological Interactions. *3(3-0-0) . S(Alt. yrs, even). Preq: MEA 460 and MEA/ZO 449.* Space-time relationships between physics and biology; influence of Reynolds Number on aquatic life style; aspects of physical and biological mathematical modeling; influence of biology on physical phenomena; influence of static physical/chemical properties on biology; influence of dynamic physical phenomena (turbulence, waves and advection) on biology within the water column and its boundaries. Credit is not allowed for both MEA454 and 554

MEA 455 Micrometeorology. *3(3-0-0) . F. Preq: MEA 422 or MAE 308.* Energy budget near the earth's surface; soil temperatures and heat transfer; air temperature, humidity, and wind distribution in the planetary boundary layer; fundamentals of viscous flows and turbulence; semiempirical theories of turbulence; exchanges of momentum, heat and moisture in the atmospheric surface layer; air modification due to changes in surface properties; agricultural and forest micrometeorology.

MEA 459 Field Investigation of Coastal Processes. *5(3-5-0) . Preq: MEA 250 and MEA 251.* Coastal zone processes and dynamics with emphasis on the forcing factors that regulate changing coastal landforms, the ecology and physicochemical character of coastal ocean water-masses, seabed morphologies, landscape academes, etc. Field observations and field techniques will be emphasized in tidal-freshwater coastal wetlands, estuaries, barrier island, tidal inlets, continental shelves and shelf-margin habitats. Additional feeds required.

MEA 460 Principles of Physical Oceanography. *3(3-0-0) . F. Preq: MA 242. Coreq: PY 205 or PY 208.* Introduction to principles and practices of physical oceanography. Equation of state of seawater; energy transfer to the ocean by thermal, radiative and mechanical processes; the heat budget; oceanic density distribution; oceanic boundary conditions; conservations equation; air-sea interaction; global fluxes and general description of major ocean currents. Credit is not allowed for both MEA 460 and MEA 540

MEA 461 Undergraduate Cruise Experience. *1(1-0-0) . F,S. Coreq: MEA 200 or MEA 220.* Broad exposure to planning and execution of oceanographic research operations, including demonstration of techniques and equipment regularly used aboard ships and familiarization with acquisition and processing of oceanographic data via preparation for and participation in a demonstration cruise under the guidance of NCSU oceanography faculty members.

MEA 462 Observational Methods and Data Analysis in Marine Physics. *3(2-2-0) . Preq: MEA 460.* Practical experience in the observational techniques used by physical oceanographers. Basic instrumentation described, emphasizing principles rather than detailed descriptions. Both direct and indirect techniques used to define the three-dimensionalcirculation of the ocean as a function of time.

MEA (PY) 463 Fluid Physics. *3(3-1-0) . Preq: MA 341 and PY 208.* Derivation of the basic equations governing fluid motion in a rotating coordinate system. Equations include conservation of mass or the continuity equation, the momentum equations, the thermodynamic energy equation, and the vorticity equation. Application to simplified oceanic flows which include surface gravity waves, inertial motion, geostrophic motion, Ekman dynamics, and vorticity dynamics. Credit is not allowed for both MEA 463 and MEA 700

MEA 464 Ocean Circulation Systems. *3(3-0-0) . S. Preq: PY(MEA) 463.* Dynamical processes governing ocean circulation. Driving of ocean currents by the atmosphere, currents on a rotating spherical earth. Mid-ocean gyre, western boundary currents, equatorial current systems, and polar circulation. Currents in coastal regions and shallow-water processes.

MEA 465 Geologic Field Camp I. *4(0-0-0) . Sum. Preq: MEA 440, MEA 450, MEA 451. Coreq: MEA 465 and MEA 466.* Geological field instruments and techniques. Geological field mapping of various geologic structures and terrains within areas of little deformed sedimentary strata. Additional fees required. First part of six weeks out-of-state summer field camp.

MEA 467 Marine Meteorology. *3(3-0-0) . S. Preq: MEA 422 or MEA 460.* Basic equation and concepts. Review of ocean and atmospheric circulations. Ocean mixed layer, air-sea interaction and coastal ocean and meteorological processes, marine boundary layer and cloud processes.

MEA 468 Invertebrate Paleontology and Biostratigraphy. *4(3-3-0) . F. Preq: MEA 102 and MEA 111, or ZO 402.* Study of fossil invertebrates and their applications to problems and concepts of paleoecology, correlation of strata, evolution and broader concepts of earth history. Required field trips.

MEA 469 Ecology of coastal Resources. *3(3-0-0) . S. Preq: MEA 250, MEA 220.* Anthropogenic impacts on estuarine and coastal marine ecosystems. Survey of basic biological, physical, chemical and geological mechanisms underlying habitat-specific functioning, followed by discussion, in-class presentation, and critique of real and hypothetical case studies involving anthropogenic impacts.

MEA 470 Introduction to Geophysics. *3(3-0-0) . S,(ALT). Preq: PY 208 or 212.* Structure of the earth, a dynamic and evolving entity, as inferred from seismology, gravity, magnetism and heat flow. Geodynamic processes responsible for continental drift; plate tectonic theory; regional geophysics of selected areas.

MEA 471 Exploration and Engineering Geophysics. *3(3-0-0) . S,(ALT). Preq: PY 208.* Geophysical methods applied to exploring the earth's shallow sub-surface. Principles of gravity, magnetic, electrical, and seismic exploration surveys. Planning, conducting, and interpreting geophysical surveys.

MEA (CH) 473 Principles of Chemical Oceanography. *3(3-0-0) . F. Preq: CH 201.* Chemical processes controlling the composition of oceans, including discussions of chemical equilibria, biological cycling of nutrients and use of chemical tracers in marine environment; consideration of origin and chemical history of oceans. Creditis not allowed for both MEA 473 and MEA 573

MEA (CE) 479 Air Quality. *3(3-0-0) . S. Preq: CE 373,CE 382; or CHE 311(CHE Majors); or MEA 421 (MEA Majors). Coreq: ST 370 ; ST 380 (MEA Majors).* Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the $acid rain: problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 or CE/MEA 579

MEA 481 Principles of Geomorphology. *3(2-2-0) . Preq: MEA 101 and MEA 110.* Landforms and the processes responsible for their origin. Emphasis on the geologic principles involved in interpreting the origin and evolution of various landforms, and discussion of North American geomorphic process.

MEA 485 Introduction to Hydrogeology. *3(3-0-0) . F, Alt.Yr.(Even). Preq: MEA 101, MA 242, CH 201, and PY 201, PY 205, or PY 211.* Basic science of groundwater flow in geological media. Saturated and unsaturated flow, Darcy's equation, heterogeneity and anisotrophy, flownets, storage properties of geological materials, effective stress, equations for steady and unsteady flow, recharge, groundwater exchange with surface water, groundwater flow to pumping wells, estimation of hydraulic properties of aquifers, contaminant plumes and chemical transport in groundwater.

MEA 491 Seminar on Selected Geologic Topics. *2(2-0-0) . F. Preq: Senior standing in GYS, GYA, or GPY.* Study and discussion of selected topics from the geological literature. Preparation of a major library research paper.

MEA 493 Special Topics in MEAS. *1-6. F.S. Preq: Departmental approval required.* Directed individual study or experimental course offering.

MEA 495 Senior Seminar in the Marine Sciences. *1(1-0-0) . F.* Discussions of selected topics from the marine literature. Marine scientists from the public and private sectors introduce students to career options. Strategies for finding jobs and graduate programs are presented.

MEA 498 Internship in MEAS. *1-6. F,S,Sum.* Awards academic credit for learning that occurs during internships. Requires daily journal and written summary report. Successful completion of the course based on review of summary report by an MEAS faculty, who shall be identified by the studentprior to the internship. Transportation expenses may be incurred. MEAS majors only.

MILITARY SCIENCE

MS 101 Introduction to Leadership and Values I. *1(1-1-0) . F. Preq: Freshman standing or Sophomore standing.* This course introduces students to fundamental components of service as an officer in the United State Army. Initial lessons form building blocks of progressive lessons in values, fitness, leadership and officership. Classroom instruction includes$life skills$ including physical and mental fitness, communication theory, and interpersonal relationships. Upon completion, students will be prepared to receive more complex leadership instruction.

MS 102 Basic Military Leadership. *1(1-1-0) . F, S.* Familiarizes students with the fundamentals of map reading, land navigation techniques, small unit tactics and leadership, personal goal setting, Army Leadership and values, ethical decision making as well as Army basics.

MS 106 Map Reading. *1(1-1-0) . S. Preq: Freshman standing or Sophomore standing.* Basic map reading techniques: determination of present location through the use of intersection and resection procedures; information for outdoor activities, ranging from competitive orienteering to occasional backpacking.

MS 201 Intermediate Leadership Theory I. *2(2-1-0) . F.* Instruction is orientated on communication and leadership theory using practical exercise to apply communications and leadership concepts. Critical $life skills$ and their relevance to success in the Army are stressed. Upon completion of this course, students will understand fundamental principles of leadership, and be prepared to intensity practical application in subsequent coursework.

MS 202 Intermediate Leadership Theory II. *2(2-1-0) . S. Preq: MS 101.* This course focuses on the purpose, roles, and obligations of commissioned officers. Coursework will include origins of Army institutional values and practical application in decision making and leadership. Upon completion of this course, studentswill possess and understanding of leadership and officership, demonstrate the ability to apply these skills, and be prepared for the Advanced Military Science Program.

MS 295 Special Topics in Military Leadership. *3(2-0-2) . F,S,SUM1,SUM2.* Intensive supervised study in applied military leadership and management in an organization or historically applied scenario. Departmental approval required.

MS 301 Military Leadership and Training Management. *3(2-3-0) . F. Preq: ROTC advanced course cadet.* Organizational leadership and processes in the Army; leadership activities and key management functions. Management and conduct of group training activities.

MS 302 Intermediate Small Unit Tactics. *3(2-3-0) . S. Preq: ROTC advanced course cadets.* Planning, organizing and executing military operations at the squad and platoon level. Focus on the leader's actions, map reading, and navigation.

MS 401 Advanced Military Science - Leadership and Systems Management. *3(3-2-0) . F. Preq: MS 301, MS 302.* A course designed to familiarize the student with the fundamentals of staff operations and procedures, military correspondence, and the U.S. Army training management system. Also included are the Officer Personnel Management and Officer Evaluation Report systems (OPMS/OER), the Army logistics system, mobilization and deployment, and intelligence/electronic warfare.

MS 402 Advanced Military Science - Military Justice, Ethics and Professionalism. *3(3-2-0) . S. Preq: MS 401.* The role of military justice, the Uniform Code of Military Justice (UCMJ) and the procedures for accomplishing certain legal actions. Ethics and professionalism of the officer corps. Also included are counseling techniques and continued preparation for the transition from cadet to commissioned officer. Emphasis on student interaction and small group exercise practical application.

MS 495 Special Topics in Military Science. *3(2-0-2) . F,S,SUM1,SUM2.* Individualized readings/research of Company Command level issues and implementation of the Uniform Code of Military Justice, DOD Policies, and additional duties required of company grade officers. Departmental approval required-advanced course students only.

MATERIALS SCIENCE AND ENGINEERING

MSE 200 Mechanical Properties of Structural Materials. *3(3-0-2) . F,S,Sum. Preq: CH 101.* An introduction to the atomic and grain structure of structural materials emphasizing the mechanical properties. Effects of mechanical and heat treatments on structure and properties. Fatigue and creep of materials, fracture toughness, mechanical and non-destructive evaluation, effects of environment. Design considerations, characteristics of metals, ceramics, polymers and composites. Not for Materials majors

MSE 201 Structure and Properties of Engineering Materials. *3(3-0-2) . F,S. Preq: CH 101.* Introduction to the fundamental physical principles governing the structure and constitution of metallic and nonmetallic materials and the relationships among these principles and the mechanical, physical and chemical properties of engineering materials.

MSE (BME) 203 Introduction to the Materials Science of Biomaterials. *3(3-0-0) . F. Preq: C- or better in CH 101, CH 102 and PY 205.* This course introduces fundamental physical principles governing the structure, processing, properties and performance of metallic, ceramic and polymeric materials. Relationships are developed defining how mechanical, physical and chemical properties are controlled by microstructure and chemistry. Material failure

modes are dveelped with an emphasis on biocompatibility and the applications/performance of materials in the human body. Basic aspects of material biocompatibility are presented, leading into studies of the current and future applications of biomaterials.

MSE 210 Materials Characterization Laboratory. *2(1-3-0) . S. Coreq: MSE 201.* Concepts and applications of basic materials characterization techniques, including diffraction, microscopy (optical and electron), thermal analysis, mechanical testing techniques, and spectroscopic analysis of materials.

MSE 230 The Impact of Materials on Civilization. *3(3-0-0) . S.* Exploration of the role of materials in the development of modern industrial civilizations by putting technology into a historical context and examining the advances made possible by innovations with materials starting with the Stone age. Basic concepts in materials science and engineering which focus on the relationship between processing, structure, properties and performance. Material classes covered include metals, ceramics, polymers, composites and semiconductors.

MSE 301 Equilibrium and Rate Processes. *3(3-0-0) . S. Preq: MA 241. Coreq: MSE 201.* Review of classical thermodynamics and thermodynamic relationships. Use of statistical methods of describe entropy and other thermodynamic properties. Description of vapor-, liquid-, and solid-phase equilibrium in unary and other multicomponent material systems. Treatment of ideal and nonideal solution behavior in inorganic alloys and organic polymers. Application of gas-phase reaction kinetics and identification of the criteria required for reaction equilbria.

MSE 310 Computer Applications for Materials Engineering. *2(1-3-0) . F.* Computer applications for processing and analyzing materials data and performing materials design and modeling calculations.

MSE 321 Phase Transformations and Diffusion. *3(3-0-0) .S. Prq: MSE 330.* Types, mechanisms, and kinetics of solid state phase transformations are presented with selected applications of solid state transformations. Mechanisms of diffusion and techniques for diffusion calculations.

MSE 324 Polymer Characterization Laboratory. *1(0.50-1.50-0) . F. Coreq: MSE 425.* Laboratory experiments designed to illustrate the preparation and characterization of polymer materials, including: polymer synthesis, molecular weight measurement, microscopic examination, thermal properties, mechanical properties, and permeability.

MSE 330 Crystal Chemistry and Phase Equilibria. *3(3-0-0) . F. Preq: MSE 301.* Structure of engineering materials from electronic to atomic and crystallographic considerations. Structural imperfections and their effects on properties. Applications of thermodynamic principles to the construction and use of phase diagrams in materials systems. Development of and correlation of microstructure with phase diagrams.

MSE 331 Electronic Properties of Materials. *3(3-0-0) . S. Preq: PY 208. Coreq: MSE 333.* Treatment of the role of electrons and electron energy (band) structures in determining the fundamental properties of materials- electrical, magnetic, optical, and thermal. Introduction to quantum mechanics; Brillouin zones; band structures. Theoretical and phenomenological basis of each property as manifested in various classes of materials; examples and demonstrations of technological applications.

MSE 333 Electronic Properties Laboratory. *1(0-3-0) . S. Preq: MSE 330. Coreq: MSE 331.* Laboratory experiments demonstrating major electronic properties of all classes of materials; electrical conduction (temperature and defect dependence); characterization of semiconductors; optical measurements and characterization; magnetic behaviorand properties; electron beam techniques used to characterize devices.

MSE 350 Mechanical Properties of Materials I. *3(3-0-0) . Preq: MA 341.* Covers fundamental topics in stress analysis and mechanics of materials including statics and structures, elasticity, plasticity, fracture, fatigue, testing methods, and engineering applications.

MSE (MAT, NE) 409 Nuclear Materials. *3(3-0-0) . F. Preq: MSE 201.* Properties and selection of materials for optimum design of nuclear steam systems. Implications of radiation damage to reactor materials and material problems in nuclear engineering. Overview of nuclear steam systems, crystal structure and defects,dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials.

MSE 423 Introduction to Materials Engineering Design. *3(3-0-0) . F. Preq: Senior standing in MSE. Coreq: MSE 431, MSET 430.* Materials selection in engineering design involving lecture, cooperative and problem based learning techniques. Course stresses creative thinking, problem solving methodology, interdependence of design with analysis and evaluation, teamwork and sharpening of communication skills. Real industrial problems are introduced later which are analyzed by student teams. Well developed proposals are submitted to sponsors which define future work under MAT 424.

MSE 424 Materials Science and Engineering Design Project. *3(1-6-0) . S. Preq: MSE 423.* Design project in materials science and engineering requiring problem definition and analysis, synthesis, and presentation of a designed solution. Students work in groups with a faculty adviser on problems submitted by local industrial sponsors or emerging research issues that represent the major specialty areas including ceramics, metals, polymers, or electronic materials.

MSE 425 Introduction to Polymeric Materials. *3(3-0-0) . Preq: CH 220. Coreq: MSE 324.* Covers fundamental concepts in polymer science, engineering and design including molecular weight distributions, polymer physical structure, morphology, crystalline and amorphous polymers, structure-property relationships, viscoelasticity, and rubber elasticity.

MSE 430 Physical Metallurgy Laboratory. *1(0-3-0) . F. Coreq: MSE 431.* Selected microstructures in ferrous and non-ferrous metals are examined using optical and scanning electron microscopy and interpreted. Mechanical properties measurements are made on some of the same alloys in order to develop structure-property relationships.

MSE 431 Physical Metallurgy I. *3(3-0-0) . F. Preq: MSE 321, MSE 450. Coreq: MSE 430.* Application and design of selected metals and alloys in a theoretical and practical context. Relationships between mechanical behavior and alloy chemistry, microstructure, and processing. Corrosion resistance; fatigue failure; creep; brittle fracture. Design of specific microstructures.

MSE 434 Ceramic Engineering Laboratory. *1(0-3-0) . S. Coreq: MSE 435.* Ceramics are processed and examined in the laboratory. Topics include sintering, grain growth, mechanical properties and design using brittle materials and various characterization techniques relating processing to the development of microstructures and properties.

MSE 435 Physical Ceramics. *3(3-0-0) . S. Preq: MSE 201. Coreq: MSE 321, MSE 434.* Physical and chemical nature of classical and modern ceramic materials. Emphasis on crystal structures, defect structures and microstructures, and their collective effects on thermal, mechanical and electrical properties.

MSE 440 Processing of Metallic Materials. *3(3-0-0) . F. Preq: MSE 321, MSE 450. Coreq: MSE 431.* Fundamental concepts of solidification and their application to foundry and welding practices; metal forming concepts applied to forging, rolling, extrusion, drawing, and sheet forming operations; machining mechanisms and methods; powder metallurgy;advanced processing methods including rapid solidification and mechanical alloying. Credit for both MSE 440 and MSE 540 is not allowed

MSE 445 Ceramic Processing. *3(2-3-0) . Preq: MSE 434, MSE 435.* Ceramic processing of powders includes powder synthesis, characterization, mixing, and size reduction. Theoretical aspects include particle packing, particles in suspension, and some aspects of surface chemistry. Forming methods include compaction, casting, and extrusion. Firing and sintering are examined. Credit for both MSE 445 and MSE 545 is not allowed

MSE 450 Mechanical Properties of Materials II. *3(3-0-0) . Preq: MSE 350.* Plastic flow, fracture and/or failure phenomenon in solids are treated in terms of fundamental deformation mechanisms with emphasis on the role of crystal defects and microstructure. Tensile, creep and fatigue modes of deformation are included, along with design considerations and applications in-practice

MSE (CHE) 455 Polymer Technology and Engineering. *3(3-0-0) . F. Preq: MSE 425.* This course will cover commercial polymers, polymer blends and miscibility, dynamic mechanical behavior, Boltzmann superposition principle, ultimate properties of polymers, polymer rheology and processing, recycling and design and selection of polymeric materials. Guest instructors from industry will give presentations on contemporary topics in polymer technology and engineering. Field trips are required.

MSE 460 Microelectronic Materials. *3(3-0-0) . Preq: MSE 331.* Processes and characterization techniques relevant to microelectronic materials science and technology. Boule growth, wafer preparation, oxidation, epitaxial growth, doping techniques, metallization, and device applications of elemental and compound semiconductors. Electrical, structural and chemical characterization

of semiconductors is included as well as materials considerations relevant to device fabrication. Credit for both MSE 460 and MSE 560 is not allowed

MSE 490 Special Topics in Materials Engineering. *1-4. Preq: Consent of Instructor.* Offered as needed for the development of new courses in materials engineering, including areas such as metals, ceramics, polymers, or microelectronic materials.

MSE 491 Materials Engineering Seminar. *1(1-0-0) . Preq: Senior standing.* Survey of topics relevant to job placement for seniors including: resumes, career opportunities, writing and speaking skills, and interview skills. Written and oral presentations by students, presentations by faculty and guests, practice interviews,and critiques.

MSE 495 Materials Engineering Projects. *1-6. F,S. Preq: Junior standing or Senior standing, Departmental approval required.* Application of engineering principles to a specific materials engineering project by a student or small group of students under supervision of a faculty member. A written report required.

MEDICAL TEXTILES

MT 105 Introduction to Medical Textiles. *3(3-0-0) . F. Coreq: CH 101 and MA 131 or MA 141.* Introduction to the structures and methods of production of polymers, fiers, yarns and farics used in medical applications. Survey of the performance requirements of current medical textiles and healthcare products used in health centers, as surgical implants and as consumer products. Overview of the structure, organization and integration of the medical textile, medical device and pharmaceutical industries within the healthcare sector. Credit not allowed if previous credit for TT 105

MT 323 Introduction to Theory and Practice of Medical Fiber and Yarn Formation. *3(3-0-0) . F. Preq: PY 211 or PY 205, PCC 203 or CH 221.* Introduction to the manufacture of fibers and filament yarns used in medical textiles. It includes the flow behavior of polymeric materials as it relates to fiber formation. It also includes the application of fiber forming theories to synthetic and biopolymeric fibers used in medical textiles. The common methods of yarn manufacture are introduced.

MT 366 Biotextile Product Development. *3(3-0-0) . F. Preq: MT105 or PCC105, MT323, PCC203 or CH221, ZO160, PY205 or PY211.* Biotextile product development of surgical implants designed for the repair and replacement of tissues in cardiovascular, wound healing, orthopedic, dental and tissue engineering applications. Mechanical, physical, chemical, surface and biological properties including cell/biotextile interactions of fibers and fibrous structures will be reviewed. Bioresorbable polymers, drug delivery systems, fiber reinforced composites, and strategies for surface modification and biorecognition will be reviewed in the light of material selection and structural design. Credit for TE 366 and TE 466 is not allowed.

MT 381 Medical Textile and the Regulatory Environment. *3(3-0-0) . S. Preq: Junior standing.* The course will focus on the legal and regulatory environment as it impacts the design, manufacture, marketing and distribution of medical textiles and healthcare products. Fundamentals of legal theory, contract law, intellectual property, licensing, product liability and the Food and Drug Administration will be covered, providing the student with the ability to recognize and understand the legal issues involved with the medical textile supply chain.

MT 386 Medical Textiles Supply Network. *3(3-0-0) . F. Preq: MT 105, TMS 210 or (TT 221 and TT 252), TAM 380, ZO 160.* Study of the supply system for medical textiles and healthcare products among organizations and firms, including information requirements that are exchanged between producers, manufacturers, distributors, retailers, clinicians, institutional and individual users. Consideration of the market system, product pricing, channels to market, product lead times and the role of product managers. Modeling and simulation of supply networks will also be studied. Credit cannot be given for both MT 386 andTAM 486

MT 432 Biotextiles Evaluation. *3(2-2-0) . S. Preq: MT 323, ZO 160. Coreq: MT 366 or TE 466.* Evaluation of the performance of biotextiles and medical polymers in biological and microbiological environments, with an emphasis on in vitro and in vivo techniques for testing the biocompatibility and biostability of implantable biomedical products. Related issues will deal with quality assurance systems, inspection and sampling plans, ISO certification, good manufacturing practices, reference materials and organisms, and the use of accelerated tests and animal trials so as to meet regulatory requirements.

MT 435 Evaluation of Medical and Protective Textiles. *3(3-0-0) . S. Preq: Senior standing, TMS 211 , PY 211 or PY 205.* Scientific principles and practices involved in the testing and qualification of the protection and comfort performance of medical and protective clothing.

MT 452 Formation, Structure and Assembly of Medical Textile Products. *3(2-3-0) . F. Preq: MT 323, TMS 210 or (TT 221 and TT 252), PY 208 or PY 212.* Braiding, weaving, knitting and nonwoven technologies in the design, patterning, formation and assembly of medical textiles and healthcare products. Specialized laminating, finishing joining, cleaning and sterilizing techniques for conversion of textile structures into medical products. Structure/property relationships in terms of physical, chemical and biological performance of medical textiles and healthcare products.

MT (PCC) 471 The Chemistry of Synthetic and Natural Bipolymers. *3(3-0-0) . F. Preq: CH 220 or CH 221.* Introduction to natural and synthetic biopolymers used for biomedical applications. Goals and challenges of biomaterials selection for biomedical engineering. Polymer concepts of polymerization and characterization. Sources/synthesis, chemical and physical properties and degradation mechanisms are described. Polymer classes include: polysaccharides, proteins, polyesters, polyurethanes, polyanhydrides and polyethers.

MT 482 Healthcare Product Management. *3(3-0-0) . S. Preq: MA 231 or MA 241, ST 311 or ST 361, MT 386 or TAM 380.* Overview and analysis of the entire health care complex, the markets, the needs, and especially the use of medical and biotextile products to meet these needs. Study of the product design, production, and distribution systems for medical textiles and biotextiles and other healthcare products. Covers roles of all organizations including designers, inventors, producers, buyers, consumers and users. Study of differences in regulatory systems, product testing, manufacturing quality control systems, and distribution and tracking systems.

MUSIC

MUS 100 Instrumental Music. *1(0-3-0) . F,S. Preq: Satisfactorily passing audition.* The study and performance of instrumental music. Repertoire dependent upon instrument and level of interest and accomplishment.

MUS 101 Beginning Class Piano I. *1(0-3-0) . F,S.* Introductory course for students with no previous piano experience. Music notation, chord formation, keyboard techniques, and ensemble playing. Reading and playing developed through folk, popular, and classical repertoire.

MUS 102 Beginning Class Piano II. *1(0-3-0) . F,S. Preq: Consent of Instructor.* A continuation of MUS 101. Further development through the study of more advanced repertoire.

MUS 110 Choral Music. *1(0-4-0) . F,S. Preq: Satisfactorily passing audition.* Study and performance of choral music by participation in Varsity Men's Glee Club (male chorus), Women's Choir, New Horizons Choir (mixed chorus), or Chamber Singers.

MUS 120 Rudiments of Music. *3(3-0-0) . F.* Students with limited musical experience learn to read and notate music as well as sing and play a variety of melodies on the piano with simple chordal accompaniment. Repertoire includes music from classical, folk, and popular traditions.

MUS 150 Vocal Techniques. *1(0-2-0) . F,S.* Development and practice of vocal techniques suitable to solo and ensemble singing in a variety of musical styles, both historical and contemporary.

MUS 160 Basic Conducting. *1(2-0-0) . S. Preq: Ability to read music.* Development and practice of skills and techniques necessary for conducting all types of musical ensembles. Emphases include use of baton, basic and complex conducting patterns, left hand independence and expressivity, and score study. Opportunity to conduct student ensembles.

MUS 180 Introduction to Musical Experiences. *3(3-0-0) . F,S.* Examination of western musical materials, forms, styles and history through the primary musical experiences of composing, performing, and listening. Course designed for students with no formal musical training.

MUS 200 Understanding Music. *3(3-0-0) . F,S.* Music as universal human phenomenon. Global approach to music's elements and concepts like melody, rhythm, and timbre; and how it functions in relationship to religious belief,

observation, and experience; its role in the formation, expression, and contestation of social identity; and its expressive power in the exposition of narrative and drama.

MUS 201 Introduction to Music Literature I. *3(3-0-0) . F.* Survey of Western art music from antiquity to end of eighteenth century. Includes examination of the art of music through discourses of philosophy (aesthetics) and anthropology (ethnomusicology). Core requirement for music minor.

MUS 202 Introduction to Music Literature II. *3(3-0-0) . S.* Survey of Western art music from end of eighteenth century through end of twentieth century. Includes examination of contemporary popular genres and impact of media and technology on music production and consumption. Core requirement for music minor.

MUS 205 Introduction to Music in Western Society. *3(3-0-0) . S, Sum.* Introduction to the art of music in Western society, for the general student. Focuses on the western art music tradition, including stylistic periods from medieval to post-modern. Begins with the study of basic musical elements, formal principles and compositional techniques.

MUS 206 America's Music. *3(3-0-0) . S.* Historical survey of music in the United States, including classical and popular, secular and religious, vocal and instrumental music genres and styles from the 18th to 21st centuries, studied in the context of relevant social and cultural issues.

MUS (AFS) 230 Introduction to African-American Music. *3(3-0-0) . F.* Comprehensive survey of African-American music in the United States from Colonial times to the, with emphasis on its unique features and contributions to American culture.

MUS (AFS) 260 History of Jazz. *3(3-0-0) . Alt yrs.* History of jazz and the contributions of major artists. Emphasis of the various styles that have contributed to this American art form. Investigation of structural forms in the jazz idiom.

MUS 300 Chamber Music Performance. *1(0-4-0) . F,S. Preq: Satisfactorily passing audition.* Performance of chamber music. Emphasis on chamber literature from the sixteen through the twentieth centuries written for a wide variety of combinations ranging from string quartets to pieces written for specific instruments and voices.

MUS 301 Basic Music Theory I. *3(3-0-0) . F,S. Preq: Ability to read music.* Introduction to Music Theory for students with no academic musical background. Basic elements of music through exercises in notation, ear training, written harmony, and formal analysis. Application through study of selected compositions from the musical literature and through creation of an original composition written by each student.

MUS 302 Basic Music Theory II. *3(3-0-0) . S. Preq: MUS 301.* Second course in Music Theory. Musical analysis of representative works. Further study of chordal functions and orchestration technics through written exercises. Compositions, written by students.

MUS 305 Music Composition. *3(3-0-0) . Preq: MUS 301, MUS 302.* Study and creation of musical works. Emphasis on writing original music and works imitative of conventional and contemporary musical styles.

MUS (ARS) 306 Music Composition with Computers. *3(3-0-0) . F, S, Sum. Preq: Some knowledge of music or computer science (e.g. CSC 200).* Survey of the theory and history of computer music, compositional algorithms, digital synthesis techniques, composition of at least one computer music work -- a computer-assisted composition for traditional instruments, a piece for computer music ontape, a real-time piece, or a piece that combines tape and instrument(s).

MUS 310 Music of the 17th and 18th Centuries. *3(3-0-0) . S.* Evolution of European music from 1600 to 1820, with emphasis on characteristics of Baroque and Classical form and style. Examination of major composers and representative works in light of social, political and cultural influences.

MUS 315 Music of 19th Century Europe. *3(3-0-0) .* A survey of 19th century European music, including analysis of its texts, forms and composers, and its relations to other art forms of the period.

MUS 320 Music of the Twentieth Century. *3(3-0-0) . S,Alt. yrs. Preq: MUS 200 or MUS 202 or MUS 301.* Study of Western Art Music from 1900 to present, emphasizing significant composers, repertoire, and compositional procedures and trends, including traditional, atonal, serial, aleatoric, electronic and computer music.

MUS 330 Music Drama. *3(3-0-0) . F.* Survey of staged musical works spanning four centuries. Emphasis on large-scale dramatic works in the genres of opera, operetta, and musical theater. Designed for students with musical and/or theatrical experience.

MUS 335 Choral Literature. *3(3-0-0) . F.* Survey of choral literature spanning five centuries. Emphasis on large-scale choral/orchestral masterworks in the genres of oratorio, passion, cantata, mass and requiem.

MUS 340 The Symphony Orchestra and Its Music. *3(3-0-0) . F,Alt. yrs. Preq: Any 200-level music course.* Development of the symphony orchestra as a performing medium through study of significant works composed during the 18th, 19th, and 20th centuries. Emphasis on contemporary role of conductor.

MUS 345 Keyboard History and Literature. *3(3-0-0) . F.* Survey of keyboard history and literature from the Renaissance through the Twentieth Century. Emphasis on significant composers, performers, social issues, aesthetics and criticism.

MUS 350 World Music I: Music of Asia. *3(3-0-0) . F.* Examination of music from a variety of Asian traditions including India and Pakistan, Japan and Korea, Thailand and Indonesia. Emphasis place on philosophical, social and religious contexts from which music emerges and in which it is experienced bynative performers and listeners. No previous formal training in music in required.

MUS 351 World Music II: Music of Africa and the Americas. *3(3-0-0) . S.* Examination of music of sub-Saharan Africa, the African Diaspora in the New World, and Native American traditions. Emphasis placed both on traditional forms of musical expression and such contemporary developments as $Afri-pop$ and $World Beat.$ No previous formal training in music required.

MUS (WGS) 360 Women In Music. *3(3-0-0) . S.* The role of women in music as patrons, teachers, composers, and performers, placing them within the social, economic, and political framework to which they belong. Emphasis on Western Art Music and the role of women in popular music. No previous formal training in music is required.

MUS 390 Applied Music. *1(1-0-0) . F,S. Preq: Music Minors, Departmental approval required.* Individual instruction in voice or instrumental performance. Includes development of technique basic to voice or instrument, as well as advancement of artistry, musicianship, and repertoire.

MUS 495 Special Topics in Music. *3(3-0-0) . F,S.* Examination of selected topics in music.

MUS 498 Independent Study in Music. *1-3. Preq: Departmental approval required.* Directed independent study of selected topics for students with specialized interests in music and/or advanced musical ability. Credit and content determined by faculty member in consultation with Director of Music.

NUCLEAR ENGINEERING

NE 201 Introduction to Nuclear Engineering. *2(2-0-0) . F. Preq: MA 241, PY 205.* An introduction to the concepts, systems and application of nuclear processes. Topics include radioactivity, fission, fusion, reactor concepts, biological effects of radiation, nuclear propulsion, and radioactive waste disposal. Designed to give students a broad perspective of nuclear engineering and an introduction to fundamentals and applications of nuclear energy.

NE 202 Radiation Sources, Interaction and Detection. *4(3-2-0) . S. Preq: PY 208. Coreq: PY 407.* Introduction to nuclear energy. Topics include radioactivity, radiation detection, interaction of radiation with matter, nuclear reactions, fission, fusion, nuclear reactors, radiation safety and protection, and laboratory measurement of nuclear radiation.

NE 235 Nuclear Reactor Operations Training. *2(1-3-0) . F.* Principles of nuclear reactor operations. Lectures to cover basic nuclear engineering theory pertaining to fission reactor operations; laboratory sessions to provide hands on training with the PULSTAR nuclear reactor including facility pre-startup checks, approach to criticality, steady state operations, and measurement of various operating parameters. Qualified students may opt to enter training and study for the U.S. Nuclear Regulatory Commission exam to become federally

licensed nuclear Reactor Operators. Does not count towards NE graduation requirements

NE 301 Fundamentals of Nuclear Engineering. *4(3-2-0) . F. Preq: MA 341,CSC 112, C or better in NE 202.* Introductory course in nuclear engineering. Neutron physics, reactor operation, and reactor dynamics. Basic principles underlying the design and operation of nuclear systems, facilities and applications. Laboratory sessions include neutron detection and measurement, reactor instrumentation, and reactivity measurements.

NE 400 Nuclear Reactor Energy Conversion. *4(3-2-0) . S. Preq: MAE 301 and a C or better in NE 301. Coreq: MAE 308.* Introduction to the concepts and principles of heat generation and removal in reactor systems. Power cycles, reactor heat sources, analytic and numerical solutions to conduction problems in reactor components and fuel elements, heat transfer in reactor fuel bundles and heat exchangers. Problem sets emphasize design principles. Heat transfer lab included. Credit will not be given for both NE 400 and NE 500.

NE 401 Reactor Analysis and Design. *4(3-2-0) . S. Preq: C or better in NE 301. Coreq: MA 401.* Elements of nuclear reactor theory for reactor core design and operation. Includes one-group neutron transport and multigroup diffusion models, analytical and numerical criticality search, and flux distribution and calculations for homogeneous and heterogeneous reactors, slowing down and thermalization models and transient isotopics. Laboratory observations and correlation of reactor measurements with theory.

NE 402 Reactor Engineering. *4(3-2-0) . F. Preq: MAE 308, NE 302, NE 401.* A course in thermal-hydraulic design and analysis of nuclear systems. Single and two-phase flow, boiling heat transfer, modeling of fluid systems. Design constraints imposed by thermal-hydraulic considerations are discussed. A thermal-hydraulics laboratory included. Credit will not be given for both NE 402 and NE 502.

NE 403 Nuclear Engineering Design Projects. *3(2-3-0) . S. Preq: NE 401, NE 402.* Projects in design of practical nuclear engineering systems. Preliminary designs developed by teams with advice by faculty as needed, with reports presented in oral and written form. Current and future systems emphasized, and use of computers encouraged.

NE 404 Radiation Safety and Shielding. *3(3-0-0) . F. Preq: NE 301 with a grade of C or better or NE 419.* Radiation safety and environmental aspects of nuclear power generation. Radiation interaction, photon attenuation, shielding theory and design project, external and internal dose evaluation, reactor effluents and release of radioactivity into the environment, transportation and disposal of radioactive waste; and environmental impact of nuclear power plants.

NE 405 Reactor Systems. *3(3-0-0) . F. Preq: NE 401. Coreq: NE 402.* Nuclear power plant systems: design criteria, design parameters, and economics. Topics covered include: PWR, BWR, core design, primary loops, auxiliary and emergency systems; containment, reactor control and protection systems, accident and transient behaviors.

NE 406 Nuclear Engineering Senior Design Preparation. *1(1-0-0) . F. Preq: NE 401. Coreq: NE 402.* Preliminary design phase in nuclear engineering systems to prepare for the final phase design. Preliminary designs developed by teams with advice of faculty, with reports presented in oral and written form. Current and future systems emphasized, and use of computers encouraged.

NE 408 Nuclear Engineering Design Project. *3(3-0-0) . S. Preq: NE 406.* Projects in design of practical nuclear engineering systems. Preliminary designs developed by teams with advice by faculty as needed, with reports presented in oral and written form. Current and future systems emphasized, and use of computers encouraged.

NE (MAT, MSE) 409 Nuclear Materials. *3(3-0-0) . F. Preq: MAT 201.* Properties and selection of materials for optimum design of nuclear steam systems. Implications of radiation damage to reactor materials and material problems in nuclear engineering. Overview of nuclear steam systems, crystal structure and defects,dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials.

NE 412 Nuclear Fuel Cycles. *3(3-0-0) . S. Preq: NE 401.* Processing of nuclear fuel with descriptions of mining, milling, conversion, enrichment, fabrication, irradiation, reprocessing, and waste disposal. In-core and out-of-core nuclear fuel management design, including objectives, constraints, decisionsand methodologies. Nuclear power plant and fuel cycle economics.

NE (PY) 414 Electromagnetism I. *3(3-0-0) . F. Preq: PY 203 or PY 208, MA 341.* First semester of a two-semester sequence. An intermediate course in electromagnetic theory using the methods of vector calculus. Electrostatic field and potential, dielectrics, solution to Laplace's and Poisson's equations, magnetic fields of steady currents

NE (PY) 415 Electromagnetism II. *3(3-0-0) . S. Preq: PY 414.* A continuation of PY 414. Electromagnetic induction, magnetic fields in matter, Maxwell's equations, wave guides, radiation.

NE 418 Nuclear Power Plant Instrumentation. *3(3-0-0) . F. Preq: ECE 221 or ECE 331.* Instrumentation and supporting systems required for control and protection of a nuclear power plant. Radiation measurement, process measurement, and reactor operating principles used to develop instrumentation requirements and characteristics. Requirements and implementations of instrumentation, control and protection systems for pressurized and boiling water reactors. Design and implementation issues include power supplies, signal transmission, redundancy and diversity, response time, and reliability.

NE 419 Introduction to Nuclear Energy. *3(3-0-0) . S. Preq: PY 202 or PY 208.* Electrical power generation from nuclear fission, fundamental aspects of fission chain reaction, and reactor design. Reactor types, their static and dynamic characteristics and instrumentation. Reactor operation and safety. Nuclear fusion and fusionreactor development.Not open to majors in Nuclear Engineering

NE 491 Special Topics in Nuclear Engineering. *1-4. Preq: Consent of Instructor.* Detailed coverage of special topics.

NONPROFIT STUDIES

NPS 490 Internship in Nonprofit Studies. *4(1-0-10) . S, Sum. Preq: PS 203, COM 466.* The 150-hour internship provides students with the opportunity to apply the knowledge, skills, and abilities gained through their coursework in the minor in Nonprofit Studies to a nonprofit organizational work setting. The course will include a bi-weekly, two-hour seminar that focuses on careers in the nonprofit sector and nonprofit employment strategies. Students will discuss and reflect upon the service-learning themes of the minor in Nonprofit Studies as they relate to their ongoing internship experiences. Departmental approval required.

NPS 498 Capstone Seminar in Nonprofit Studies. *1(1-0-0) . F, S. Preq: PS 203, COM 466. Coreq: NPS 490.* This capstone seminar integrates the knowledge, skills, and abilities gained through coursework in the minor in Nonprofit Studies through class discussions and reflective writings where students draw upon previous service-learning experiences to reflect on challenges facing nonprofit leaders. Case studies and articles that focus on the themes of the minor are used to stimulate class discussions. Nonprofit leaders serve as discussants. In addition, students complete and submit a Nonprofit Studies portfolio, which documents successful achievement of program objectives. Departmental approval required

NATURAL RESOURCES

NR 100 Introduction to Natural Resources. *2(1-3-0) . F.* Orientation to natural resources management. Case study of a current natural resource management issue including biophysical, economic, social and political dimensions. Field experience with local natural resources issues. Career orientation and counseling. Open to Natural Resources, Forest Management and University Undesignated students only

NR 300 Natural Resource Measurements. *4(2-6-0) . S. Preq: BO 360/365, CH 201/202, MA 231, PY 211, SSC 200, ST 311.* Theory and practice of measuring, analyzing, and describing the characteristics of natural ecosystems. Surveying and mapping, inventory of vegetation, soils, wildlife habitat, and hydrology. Sampling, data analysis, and presentation of data. Use of geographic information systems to store, analyze, and present environmental data. Intensive instruction and practice in communication of technical information

NR 301 Practicum for Professional Development I. *1(1-0-0) . F. Preq: Junior standing, NR Majors, NR 100.* Instruction in professional report writing and presentation, resume preparation and interview skills, professional ethics and practices, job searching skills; review and critique of professional seminars and codiments from NR 501 students; preparation for summer work experience.

NR (IDS) 303 Humans and the Environment. *3(3-0-0) . F, S.* Interactions among human populations in the biophysical system and the environment. Emphasis on current issues, ecological principles and their relationships to basic biophysical processes; considers food, population dynamics, public land and common resources, renewable natural resources, pollution, water resources, energy and non-renewable resources.

NR 350 International Sustainable Resource Use. *4(1-0-9) . Sum. Preq: Sophomore standing.* Study of sustainable use of natural resources in a global economy with consideration of consumption choices, sustainable production issues, conservation of various managed landscapes, and cross cultural perspectives. Specific topics vary somewhat byyear and study location. Travel in North America in even years and to Sweden in odd years. Domestic or international travel overnight. Depending upon travel location, possible additional expense for passport, health certificate, insurance and domestic or international travel.

NR 360 Internship Experience. *3(0-10-0) . F,S,Sum. Preq: NR 301.* Internship experience with a natural resource agency or company. Most internships require working and living off-campus.

NR 400 Natural Resource Management. *4(3-3-0) . S. Preq: ARE 336 and either ST 311 or ST 350, and Senior standing.* Theory and practice of integrated natural resource management. Quantitative optimization, economics of multiple-use, compounding and discounting, optimal rotations, linear programming. Public and private management case studies and team projects.

NR 401 Practicum for Professional Development II. *1(1-0-0) . F. Preq: NR majors, NR 360.* Preparation and presentation of journal on summer work experience, final report and oral presentation of summer work activities; instruction in presentation techniques; review and critique of seminars and documents; mentoring NR 301 students.

NR 406 Conservation of Biological Diversity. *3(3-0-0) . S. Preq: Junior standing and one year of Biological Science.* Population biology concepts fundamental to understanding the properties of the objects of conservation. Genetic diversity in agriculture, forestry, and animal breeding; the ethical and international policy issues in preservation and management.

NR (FOR) 420 Watershed and Wetlands Hydrology. *4(3-3-0) . F. Preq: SSC 200, BO 360.* Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required. Credit will not be given for both FOR(NR)420 and FOR(NR)520.

NR 421 Wetland Assessment, Delineation and Regulation. *3(2-3-0) . S. Preq: SSC 200, BO 360, FOR 212 or BO 405 and FOR 420.* Wetland definitions and systems of classification and functional assessment; methods for assessing ecological functions of wetlands; identification and delineation of jurisdictional wetlands in accordance with US Army Corps of Engineers procedures; application of federal and state regulatory programs. Five Saturday field trips are required. Credit will not be given for both NR 421 and NR 521

NR 484 Environmental Impact Assessment. *4(2-0-4) . F. Preq: FOR 212 or BO 405, NR 300 or FOR 274. Coreq: FOR 353 or FOR 554.* Impact assessment principles, practices, and their evolution. Lectures and field practicums concerning problems addressed by environmental assessment practitioners. Practical implications of current regulatory requirements, especially endangered species and wetlands.

NR (FOR) 491 Special Topics in Forestry and Related Natural Resources. *1-4. F,S. Preq: Consent of Instructor.* Independent (or group) study or research of a forestry or related natural resources topic with a faculty supervisor of the student's choice. Also courses offered on a trial basis.

NAVAL SCIENCE

NS 100 Naval Science Lab. *0(0-1-0) . F,S.* Military drill, courtesies and honors, elements of unit leadership, physical fitness and professional development of the prospective Naval/Marine Corps Officer. Required of Midshipmen 4/C.

NS 110 An Introduction to Naval Science. *2(2-0-0) . F.* Fundamental orientation to the Naval Service emphasizing the mission, organization, regulations, customs and traditions, broad warfare components of Navy and the major challenges facing today's Navy and Marine Officers.

NS 200 Midshipman 3/C Naval Science Laboratory. *0(0-1-0) . F,S.* Continuation of NS 100. Required of Midshipmen 3/C.

NS 210 Leadership and Management. *3(3-0-0) . F.* Assists students in acquiring knowledge and developing the cognitive processes necessary to make decisions in the practice of management. The student will learn the traditional foundations of management while developing decision skills to apply this knowledge in a real-world setting. The major focus is centered upon global management, ethics and social responsibility, total quality management, and cultural diversity.

NS 225 Navigation. *4(3-2-0) . S.* A broad yet thorough education in basic ship navigation. Course includes a study of various navigation methods, weather, the laws of the sea, and navigational rules. Practical work includes chart plotting and understanding relative motion. Departmental approval required.

NS 300 Midshipman 2/C Naval Science Laboratory. *0(0-1-0) . F,S. Preq: Junior standing.* Continuation of NS 200. Required of Midshipmen 2/C.

NS 310 Navigation. *4(3-2-0) . F.* A comprehensive study of the theory, principles and procedures of ship navigation, movements and employment. Course includes mathematical analysis, spherical triangulations and practical work involving sight reduction, sextant, publications and report logs.

NS 315 Naval Engineering. *3(3-0-0) . S.* Introduction to the application of engineering principles in the research, development, design, construction, and operation of ships, weapons systems, and ocean structures, with emphasis on thermodynamic processes and energy conversions.

NS 320 Naval Operations. *4(3-2-0) . S. Preq: Junior standing.* Components of general naval operations, including concepts and application of tactical formations and dispositions, relative motion, maneuvering board and tactical plots, rules of the road and naval communications.

NS 325 Naval Weapons Systems. *3(3-0-0) . F.* An introduction to the concepts and properties of electronic, physical, electromagnetic and mechanical systems to foster an understanding of the theory and principles of operation of shipboard weapons systems, emphasizing types of weapons and fire control systems, capabilities and limitations, theory of target acquisition, identification and tracking, trajectory principles, and basics of ordnance.

NS 330 Evolution of Warfare. *3(3-0-0) . Preq: Junior standing.* A survey of the evolution of warfare through the study of selected campaigns and classic battles with special emphasis on the principles of war, the military impact of leadership, and the evolution of tactics, weapons, and weaponry.

NS 400 Midshipman 1/C Naval Science Laboratory. *0(0-1-0) . F,S. Preq: Senior standing.* Continuation of NS 300. Required of Midshipmen 1/C.

NS 415 Naval Operations. *4(3-2-0) . F. Preq: NS 225 Navigation.* A thorough exploration of the operations conducted by the U.S. Navy. Course includes a study of U.S. Naval evolutions, operations, command & control, communication, and an introduction to naval warefare doctrine. Practical applications include thedetermination of advanced maneuvering methods through and in-depth understanding of relative motion. Departmental approval required.

NS 420 Naval Leadership and Management II. *3(3-0-0) . S. Preq: Senior standing.* Skills and abilities needed for competence as a commissioned officer in the area of human resources management, naval personnel management, material management, and the administration of discipline.

NS 430 Amphibious Warfare. *3(3-0-0) . S, Alt yrs. Preq: Senior standing.* A survey of the projection of sea power ashore with special emphasis on the evolution of and innovation in amphibious warfare in the 20th Century through the study of historical amphibious landings and campaigns.

NUTRITION

NTR (ANS, FS) 301 Introduction to Human Nutrition. *3(3-0-0) . F,S,Sum. Preq: Sophomore standing.* Functions, dietary sources and

deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery. Food science majors may use as a free elective only

NTR 390 Nutrition Seminar. *1(1-0-0) . S. Preq: Junior standing.* Location of recent literature in the library and discussion of current topics in nutrition. Guest lectures on career opportunities and jobs available in the fields of human and animal nutrition. Use of computer databases to conduct a literature search on the chosen topic. Preparation and presentation of a final oral report, including an abstract and effective visual aids.

NTR (FS) 400 Principles of Human Nutrition. *3(3-0-0) . F, S, Sum. Preq: CH 220, CH 221; ZO 160 or BIO 181/183.* Overview of fields of Nutritional Sciences; functions of nutrients in the human body; sources and properties of nutrients; relationships of food industry practices to nutrition. Credit will not be given for both NTR (FS)400 and NTR 500

NTR (ANS, PO) 415 Comparative Nutrition. *3(3-0-0) . F. Preq: CH 220 or both 221 and 223.* Principles of nutrition, including the classification of nutrients and the nutrient requirements of and species for health, growth, maintenance and productive functions.

NTR (ANS) 419 Human Nutrition in Health and Disease. *3(3-0-0) . S. Preq: Junior standing, ANS 230, or ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415.* Current concepts regarding, and physiological bases of the roles of nutrition in the prevention and treatment of acute and chronic disease states in humans with emphasis on the process of scientific discovery, reading of original research and transformation of research findings to public policy.

NTR 420 Community and Life Cycle Nutrition. *3(3-0-0) . F, Alt. Yr. (even). Preq: Junior standing, Human nutrition course: NTR(ANS/FS) 301, NTR(FS) 400, or NTR(ANS) 419.* Basic principles of community nutrition programming: development and assessment; nutrient requirements and nutritional concerns during pregnancy, lactation, childhood, adolescence and aging; examples of age-specific community nutrition programs and their effectiveness. Students will apply course concepts throughout the semester in community-based service-learning projects. Twenty hours of service is required. Students are expected to provide and pay for their own transportation for the community service, which will be in the greater Raleigh area.

NTR 492 External Learning Experience. *1-6. F, S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience

NTR 493 Special Problems in Nutrition. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

NTR 495 Special Topics in Nutrition. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PLANT BIOLOGY

PB 101 Perspectives on Botany. *1(1-0-0) . F.* Orientation to modern botany, including discussions of historical background, relation to other sciences, the nature of modern subdisciplines, professionalism and ethics, local resources of personnel and facilities, educational opportunities, and career possibilities.

PB 102 Introduction to Research. *1(1-0-0) . S. Preq: BO 101.* Overview of research resources available to students. Methods of access to current information in chosen area of specialty. Interact with several faculty about research opportunities, develop a research proposal.

PB 200 Plant Life. *4(3-3-0) . F,S,Sum.* An introduction to the structure, processes, and reproduction of higher plants, including the diversity of the plant kingdom and principles of inheritance, ecology, and evolution. Credit cannot be given for both BO 200 and BO 250.

PB 213 Plants and Civilization. *3(3-0-0) . S. Preq: BIO 125, BIO 105 or BO 200.* Economic social, political, religious, and medical roles of plants and plant products in human civilization. Foods, beverages, drugs, fibers, oils, latexes, religious symbols and elements.

PB 215 Medicinal Plants. *3(3-0-0) . F. Preq: CH 101 and any one of the following courses: BIO 125,BIO 181,BO 200,ZO 150,ZO 160.* Plants and their derived pharmaceuticals in Western medicine and in herbal medicine.

PB 220 Local Flora. *3(2-2-0) . S. Preq: BIO 125 or BO 200.* Structural terminology of vascular plants, field identification of plant species using popularized field guides, description of plant community types and their soil and topographic features.

PB 222 Kingdom of Fungi. *3(3-0-0) . S. Preq: BIO 125 or BIO 105 or BO 200.* Survey of fungal kingdom. Economical, historical and practical aspects of fungi and their impact on humankind. Mushrooms, molds, mycorrhizae, maladies, and mutualisms. Term paper of students' choice.

PB 250 Plant Biology. *4(3-3-0) . F.* An introduction for Life Science majors to the ecology, structure, function, processes, reproduction and evolution of higher plants. BIO 181 and BIO 183 or BIO 125 ; Students may not receive credit for both BO 200 and BO 250.

PB 277 Space Biology. *3(3-0-0) . F. Preq: BIO 125 or BIO 105 or BO 200 or ZO 150 or BIO 183 or BAE(BIO) 235.* Overview of the biology of plants, animals and humans in the space environment, including gravitational biology, aerospace medicine, search for extraterrestrial life, terraforming and life support.

PB 295 Special Topics in Botany. *1-4. F,S,Sum. Preq: Consent of Instructor.* Trial offerings of new or experimental courses in Botany at the early undergraduate level.

PB 321 Introduction to Whole Plant Physiology. *3(3-0-0) . F. Preq: BIO 125 or BIO 181 or BIO 283 or BO 200 or ZO 160; CH 101/102 plus CH 201/202 or CH 220 or CH 221.* Physiology of higher plants with emphasis on whole plant aspects including structure-function relationships, water and solute movement, energy sources and needs, plant growth and development, and the impact of plant physiology findings on agriculture.

PB 360 Introduction to Ecology. *3(3-0-0) . F,Sum. Preq: A 100-level biology course.* The science of ecology, including factors which control distribution and population dynamics of organisms, structure and function of biological communities, and energy flow and nutrient cycling in ecosystems; contrasts among the major biomes; and, principles governing ecological responses to global climatic and other environmental changes.

PB 365 Ecology Laboratory. *1(0-3-0) . F,Sum. Coreq: BO 360.* Laboratory coordinated with BO 360 lecture, illustrates basic principles of environmental measurement, data analysis, limiting factors, adaptation, biogeography, succession, populations, communities, ecosystems, and competition and predation by means of field trips and laboratory experiments.

PB 400 Plant Structure and Diversity. *4(3-3-0) . S. Preq: BIO 125 or BIO 183 or BO 200 or BO 250.* Survey of the structure and diversity of plants. Emphasis on anatomy, including cells, tissue systems, and organs, morphology, evolutionary trends, adaptive strategies, and bases for assumed phylogenetic relationships of fossil as well as living forms. Two one-day weekend field trips.

PB 403 Systematic Botany. *4(3-3-0) . F. Preq: BO 200, BO 250, BIO 183, Junior standing.* The course introduces basic and contemporary systematic principles and methods as applied to vascular plants, with emphasis on flowering plants. It covers classification, identification, phylogenetics, and molecular approaches, and surveys important and common plant families representing major groups of vascular plants.

PB 405 Wetland Flora. *3(2-3-0) . F. Preq: BO 200 or BO 250 or BO 403 or FOR 212.* Plant morphological terminology and identifications of wetland plants; discussion of wetland flora, plant communities, functions and values of North Carolina wetland types; several one-day weekend field trips required.

PB 413 Introductory Plant Anatomy. *4(3-3-0) . S. Preq: BO 200.* Organelles, cells, tissue systems, and organs of flowering plants and selected gymnosperms. Microscope use on fresh, cryostat, and prepared plant sections. Histochemistry of plant cells and tissues.

PB (ZO) 414 Cell Biology. *3(3-0-0) . F. Preq: CH 223, PY 212, ZO 160, or 250.* The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.

PB 421 Plant Physiology. *3(3-0-0) . S. Preq: BIO 183 or ZO 160, or BO 200 and CH 220 or CH 221.* Physiology of higher plants with emphasis on biochemical, cell biological and molecular aspects of how plants function. Unique aspects of regulation of plant metabolism including photosynthesis, respiration, nitrogen fixation, cell wall biosynthesis, growth and stress responses will be emphasized. The course is intended for students interested in postgraduate studies in plant biology.

PB 422 Plant Physiology Laboratory. *1(1-0-0) . S. Coreq: BO 421.* Laboratory to accompany BO 421. Exercises are designed to study plant processes such as respiration, photosynthesis, tropisms, and secondary metabolite accumulation. Basic laboratory procedures in separation and analytical techniques including electrophoresis, chromatography and spectroscopy and at least one library research project will be included. The course is intended for students interested in postgraduate studies in plant biology and in technical positions in plant biology research laboratories.

PB 445 Paleobotany. *4(3-3-0) . S (Alt. Yr. Odd). Preq: BIO 181 or MEA 102.* Morphologic, taxonomic, geologic and evolutionary relationships of fossil plants; emphasis on vascular plants; discussions of taphonomy, biogeography and palynology. Requires weekend field trips at student expense. Credit will not be allowed for both BO 445 and BO 545.

PB 480 Introduction to Plant Biotechnology. *3(3-0-0) . F,S. Preq: CH 221; BO 421 or GN 411 or BCH 451.* Introduction to molecular techniques in the plant sciences, gene identification and isolation, plant tissue culture and transformation, and methods for working with single and multiple locus traits. Discussions of the role and potential of plant genetic engineering to solve problems facing agriculture.

PB (BIT) 481 Plant Tissue Culture and Transformation. *2(2-5-0) . S, Alt. yrs.(odd). Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Basic techniques in plant tissue culture and transformation. Empirical approaches to techniques in plant tissue culture, designing transgenes for expression in specific plant cell organelles and tissues, use of reporter genes to optimize transformation, and troubleshooting transformation. Laboratory sessions provide hands-on experience with plant tissue culture and transformation. Use of reporter genes, fluorescence microscopy and digital imaging. Half semester course, first part.

PB 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PB 493 Special Problems in Botany. *1-6. F,S. Preq: Sophomore standing.* A learning experience within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PB 495 Special Topics in Botany. *1-6. F,S,Sum. Preq: 8 hrs. of Botany courses.* Individualized study, under faculty supervision, of botanical topics in the student's area of interest and not covered in existing courses. Development of a new course on a trial basis.

POLYMER AND COLOR CHEMISTRY

PCC 105 Introduction to Polymer and Color Chemistry. *3(2-2-0) . F.* Introduction of topics related to Polymer and Color Chemistry, e.g. computers, library, PCC curriculum, advising and elective section, introduction to textile information, fiber forming polymers, color, fundamental chemistry, periodic table, acids, bases, solutions, learning and study techniques, laboratory techniques.

PCC 106 Introduction to Polymer and Color Chemistry II. *3(3-0-0) . S. Preq: PCC 105.* Introduction of topics related to Polymer and Color Chemistry, e.g. atomic interactions and molecular bonding (ionic, covalent, London, polar), molecular structures, small molecules and polymers (natural, synthetic and biopolymers), inorganic chemistry basics, equilibria in solutions, weak acid/base systems, buffers, acidity/alkalinity, pH, introduction to organic chemistry basics, functional groups, introduction to chemical kinetics, polymerization kinetics, as well as special topics presentedby various Polymer and Color Chemistry faculty.

PCC 203 Introduction to Polymer Chemistry. *3(3-0-0) . F,S,Sum. Preq: CH 101, TC 105 or TT 105.* Organic reaction principles necessary to understand the preparation, properties and chemistry of polymers. Synthesis, applications and behavior of common classes of polymers with emphasis on those materials used in the textile industry. The chemistry and structure of natural and man-made fibers.

PCC 301 Technology of Dyeing and Finishing. *4(3-2-0) . F,S,Sum. Preq: PCC 105 or PCC 203.* Basic principles and procedures for the preparation, dyeing, printing, and finishing of natural and man-made fibers. The chemical nature of dyes and fastness properties and the chemical nature of finishes used to impart specific end-use properties.

PCC 302 Technology of Textile Wet Processing. *4(3-2-0) . F, S, Sum. Preq: TT 105 or PCC 105, TMS 211, CH 101, PY 211 or PY 205.* Introduction to the science and technology used in textile wet processing. Topics include preparation, dyeing, printing and finishing of textiles, basics of color generation and measurement. Emphasis mainly on cotton, wool, nylon and polyester. Laboratory includes experiments in wet processing and a project on statistical analysis of fabric defects.

PCC 305 Introduction to Color Science and Its Applications. *3(2-2-0) . S. Preq: PY 212 or PY 208, and PCC 301.* Basic principles and applications of color science. Physical, physiological and psychophysical aspects of color, color perception, color specification, color measurement and color control. Laboratory and computer color graphics exercises to aid understanding of color science.

PCC 310 Textile Preparation and Finishing Chemistry. *3(3-0-0) . F. Preq: PCC 301.* Topics in textile wet processing. Chemical mechanisms and unit operations in fabric preparation and finishing.

PCC 320 Textile Dyeing and Printing. *3(3-0-0) . S. Preq: PCC 301. Coreq: CH 223.* Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing.

PCC (TAM, TC) 401 Manufacturing and its Impact on Safety, the Environment, and Society. *3(3-0-0) . F. Preq: Junior standing.* Relationship of society to safety and environmental aspects of manufactured products. Quantifying manufacturing risks. Protective methods, e.g. administrative, engineering, personal, treatment, pollution prevention. Social factors, e.g. political, regulatory, legal, consumer attitudes, public policy, perceptions. Understanding complex social issues, especially situations with conflicting goals. Critical comparison of options for risk reduction, and selecting reasonable (hopefully optimal) courses of action in complex and uncertain situations. Unsolved problems of industry and society (e.g. greenhouse effect). Relationships of ethics, laws and regulations to manufacturing.

PCC 402 Introduction to the Theory and Practice of Fiber Formation. *3(3-0-0) . Preq: PCC 203, PY 208 or PY 212, MA 242, CH 201.* Flow behavior of polymeric materials as related to the formation of fibers by melt, dry and wet extrusion. Elementary theories of drawing and heat setting. Application of fiber-forming theories to synthetic and cellulosic fibers.

PCC 403 Carpet Industry. *3(3-0-0) . F, Alt yrs. Preq: Senior standing PCC 301 or 302, TT 221, 241 and 251 or TMS 210 or TE 301 and 302.* An overview of all aspects of carpet production and marketing including fiber properties and selection, yarn formation, carpet formation, dyeing and finishing, design, quality assurance and testing, marketing, and environmental issues. Instruction provided by industry professionals. May include a field trip.

PCC 407 Wet Processing Operations and Quality Control. *3(1-6-0) . S. Preq: PCC 310, PCC 320, TMS 210, and CH 431 or TC 441.* Pilot-scale batch and continuous wet processing. Selection and use of processes and quality control tests.

PCC 412 Textile Chemical Analysis. *3(2-3-0) . S. Preq: PCC 301; CH 431 or TC 441.* Application of certain techniques of analysis to fibers, textile chemicals and textile processes; ultraviolet, visible and infrared spectrophotometery; chromatography; viscometry; interfacial tension; calorimetric, gravimetric and mechanical thermalanalyses. Emphasis on solving problems of analysis involving such processes as sorption, solution, diffusion, crystallization, etc.

PCC 442 Theory of Physico-Chemical Processes in Textiles II. *3(3-0-0) . S. Preq: TE 303, CH 331, or CH 431.* Second semester of a two-semester sequence. Ideal and non-ideal solutions, colligative properties. Electro chemistry, dyeing isotherms, chemical kinetics, surface chemistry, theory of repellency and other special topics.

PCC 461 Introduction to Fiber Forming Polymers. *4(3-3-0) . F. Preq: CH 223.* Formation and properties of fiber-forming polymers. Step-growth and chain-growth polymerization. Survey of formation techniques for man-made fibers. Relationships between chemical structure and physical properties of natural and man-made fibers.

PCC 466 Polymer Chemistry Laboratory. *3(2-6-0) . Preq: TC 441 or CH 431; Senior standing.* Synthesis and characterization of polymers; thermodynamics of rubber elasticity and gelation; spectroscopic, thermal and scattering techniques for polymer analysis. The processing of polymers into fibers and films.

PCC (MT) 471 The Chemistry of Synthetic and Natural Bipolymers. *3(3-0-0) . F. Preq: CH 220 or CH 221.* Introduction to natural and synthetic biopolymers used for biomedical applications. Goals and challenges of biomaterials selection for biomedical engineering. Polymer concepts of polymerization and characterization. Sources/synthesis, chemical and physical properties and degradation mechanisms are described. Polymer classes include: polysaccharides, proteins, polyesters, polyurethanes, polyanhydrides and polyethers.

PCC 490 Undergraduate Research in Polymer and Color Chemistry. *1-6. F,S,Sum. Preq: PCC 301; PCC 461/CH 461; and TE 303, CH 331 or CH 431.* Faculty-supervised individual research for undergraduates in PCC. Students must find an advisor from within the department with whom to work on a regular basis. Intended for PCC majors

PCC 491 Seminar in Polymer and Color Chemistry. *1(2-0-0) . F,S,Sum. Preq: Senior standing.* Familiarizes student with the principal sources of polymer and color chemistry literature and emphasizes importance of keeping abreat of developments in the field. Emphasizes fundamentals of technical writing. Arranged. Intended for PCC majors3

PCC 492 Special Topics in Polymer and Color Chemistry. *3(3-0-0) . F,S,Sum. Preq: Consent of Instructor.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

PHYSICAL EDUCATION

PE 101 Fitness and Wellness. *1(0-2-0) . F,S,Sum.* Benefits and development of a personal fitness and wellness program; training principles and guidelines for cardio respiratory activities and weight training, fitness and wellness components and misconceptions, nutrition, weight control, stress management, and contemporary health issues. Satisfies the Fitness and Wellness one hour requirement for graduation.

PE 102 Fitness Walking. *1(0-2-0) . F,S,Sum.* Benefits and development of a personal physical fitness and wellness program. Knowledge, attitudes, and skills necessary for participation in a lifelong fitness walking program as an activity to improve health and fitness. For people of any age, gender, background and skill level. Satisfies the Fitness and Wellness one hour requirement for graduation.

PE 103 Water Aerobics. *1(0-2-0) . F,S, Sum.* Benefits and development of a personal physical fitness and wellness program. Individually paced water exercise program designed to increase cardiovascular endurance, muscular strength, muscular endurance, and flexibility. Satisfies the Fitness andWellness one hour requirement for graduation. Individual under medical care must have prior approval from physician before registering for the course

PE 104 Swim Conditioning. *1(0-2-0) . F,S, Sum. Preq: PE 215.* Benefits and development of a personal physical fitness and wellness program. Swim techniques that maximize fitness gains and minimize injuries. Variety of training methods including all levels of intensity. Satisfies the Fitness & Wellness one hour requirement for graduation.

PE 105 Aerobics and Body Conditioning. *1(0-2-0) . F,S,Sum.* Benefits and development of a personal fitness and wellness program. Exercise prescription, safety precautions, proper cardio respiratory exercise technique, muscular strength, muscular endurance, flexibility and body composition. Lectures and discussions on nutrition, weight control, and stress management. Satisfies the Fitness and Wellness one hour requirement for graduation.

PE 106 Triathlon. *1(0-2-0) . F,S. Preq: PE 221.* Benefits and development of a personal physical fitness and wellness program. Swim, cycle and run techniques that maximize fitness gains and minimize injuries. Bicycles and ANSI approved helmets must be provided by the students. Satisfies the Fitness and Wellness one hour requirement for graduation.

PE 107 Run Conditioning. *1(0-2-0) . F,S,Sum.* Benefits and development of a personal fitness and wellness program. Emphasis on a variety of training techniques, including all levels of intensity. Satisfies the Fitness and Wellness one hour requirement for graduation.

PE 108 Water Step Aerobics. *1(2-0-0) . F,S,Sum.* An individually paced water aerobics exercise program designed to increase cardiovascular endurance, muscular strength and endurance, and flexibility. Conducted in chest-deep water on aquatic steps.

PE 109 Step Acrobics. *1(0-2-0) . F,S,Sum.* Fitness through use of basic information, skills and techniques of a safe step aerobic program.

PE 214 Beginning Swimming. *1(0-2-0) . F,S,Sum.* Swimming skills for the non-swimmer that are essential for survival in the water.

PE 215 Advanced Beginning Swimming. *1(0-2-0) . F,S. Preq: PE 214.* Continuation of Beginning Swimming: development of basic strokes, learning new strokes, and survival skills.

PE 216 Soccer. *1(0-2-0) . F,S,Sum.* Soccer with emphasis on skills development, playing strategies, and rules of the game.

PE 218 Adapted Physical Education. *1(0-2-0) . F,S. Preq: Documentation of medical restriction.* Designed for students with physical or medical problems, accommodating individual needs and limitations. Repeatable up to four semesters. For students with medical problems who are unable to take regular Physical Education classes

PE 219 Gymnastics. *1(0-2-0) . F,S.* Fundamentals of gymnastics for men and women. Coef: tumbling and vaulting; men's events: parallel bars and pommel horse; women's events: balance beam and uneven parallel bars. Safety and spotting.

PE 221 Intermediate Swimming. *1(0-2-0) . F,S,Sum. Preq: PE 214.* Emphasis on five swim strokes: Freestyle (front crawl), breaststroke, elementary backstroke, backstroke (back crawl), sidestroke. Deep water skill development (dives, treads, underwater swims). Emphasis on increased cardiovascular fitness.

PE 223 Lifeguard Training. *1(0-2-0) . F,S. Preq: PE 221.* Advanced techniques of Lifeguard Training with American Red Cross certification upon completion of course requirements. Optional fee assessed for certification.

PE 224 Water Safety Instructor. *1(0-2-0) . F,S. Preq: Current certification in Lifeguard Training or Emergency Water Safety.* Designed to qualify students for a Red Cross Water Safety Instructor's rating. Optional fee assessed for certification

PE 226 Skin and Scuba Diving I. *2(1-2-0) . F,S,Sum. Preq: PE 221.* Basic theory and skills related to skin and scuba diving. Emphasis on equipment, diving maladies, safety and physical conditioning for diving. Additional fee assessed for the open water experience and certification.

PE 227 Scuba Diving II. *2(0-1-0) . F,S. Preq: PE 226 or basic scuba diving certification.* Scuba skills development, first aid, CPR and openwater rescues.

PE 228 Springboard Diving. *1(0-2-0) . F,S. Preq: PE 215 or deep water tread for 10 minutes and swim 5 laps(250 yds).* Development of the fundamental skills of one-meter springboard diving.

PE 229 Skin & Scuba Diving Open Water Training. *1(0-2-0) . F,S,Sum. Coreq: PE 226.* Instruction and supervision in transfer of Skin and Scuba Diving skills and knowledge from the pool and classroom to the open water

environment. Out-of-class fieldtrips required. Additional fees ranging between $110 to $275 depending upon dive location.

PE 230 Pilates/Core Training. *1(0-2-0) . F,S,Sum.* This course will teach the fundamentals of Pilates which are to improve body awareness, increase breathing capacity and improve postural alignment through simultaneous stretching and strengthening movements. The goal of Pilates exercises is to achieve optimal functional fitness. The knowledge and training gained from Pilates will not only benefit an individual in their daily activities, but also improve their performance in any physical activity they choose to participate in.

PE 232 Track & Field. *1(0-2-0) . F.* Develops knowledge, skill and interest in track and field events.

PE 233 Clogging. *1(0-2-0) . F,S.* An entry level dance course stressing the fundamentals of traditional and precision clogging. Emphasis on basic foot movements, combinations and individual freestyle.

PE 234 Country Dance. *1(0-2-0) . F,S.* American Heritage dances, Texas two-step, and Western Square Dance.

PE 235 Beginning Karate. *1(0-2-0) . F,S.* Introduction to traditional Japanese karate: kihon (basic punching, striking, blocking, and kicking techniques); kata (formal drills); yakusoku kumite (pre-arranged sparring); and demonstration of ji-yu-kumite (controlled free sparring). Karate uniform required.

PE 236 Advanced Karate. *1(0-2-0) . F,S,Sum. Preq: PE 235.* Advanced training in Wado-ryu Japanese Karate. Emphasis on instruction in advanced striking, blocking, and kicking techniques. Three additional Pinan Katas. Introduction to multiple-step pre-arranged Kumite.

PE 237 Weight Training. *1(0-2-0) . F,S,Sum.* Provides essential knowledge of the Principles of Muscular Strength development and an opportunity to acquire skill in a variety of progressive resistance exercises.

PE 238 Wrestling. *1(0-2-0) . F,S.* Wrestling skills, safety considerations, and conditioning factors necessary for moderate competition in a combative sport-beginning skills through more advanced techniques

PE 239 Self Defense. *1(0-2-0) . F,S.* Basic self defense skills and techniques. Skills covered include falls, kicks, punches, and escapes; plus psychology of physical and sexual assault. Physical contact between students and instructor.

PE 240 Social Dance. *1(0-2-0) . F,S,Sum.* Basic steps and fundamentals of leading and following in the Fox Trot, Waltz, Cha-Cha, Shag, and one other current popular dance form

PE 242 Badminton. *1(0-2-0) . F,S,Sum.* Skills development, strategies and rules of singles and doubles play.

PE 243 Bowling. *1(0-2-0) . F,S,Sum.* Instruction in ball selection, grip, stance, approach, delivery, bowling etiquette, safety precautions, rules, scoring, terminology, and general theory of spare coverage. Additional fee assessed.

PE 244 Fencing. *1(0-2-0) . F,S.* Development of offensive and defensive skills; emphasis on rules, courtesy, and strategy of bouting.

PE 245 Golf. *1(0-2-0) . F,S,Sum.* Fundamentals of golf: grip, stance, alignment, swing. Rules and etiquette on the course.

PE 246 Handball. *1(0-2-0) . F,S.* Skills development, rules and strategies for singles, cut-throat, and doubles play of four wall handball

PE 247 Roller Skating. *1(0-2-0) . F,S.* Fundamental and intermediate skills of skating: starting, turning, stopping. Emphasis on balance, coordination, and endurance skating.

PE 248 Squash. *1(0-2-0) . F,S.* Skill development and strategies of play. Equipment selection, safety, history, and rules.

PE 249 Tennis I. *1(0-2-0) . F,S,Sum.* Basic tennis skills on grips, footwork, ground strokes, service. Rules and basic strategy for singles play. Introduction to volleys, lobs, overheads, and doubles.

PE 250 Tennis II. *1(0-2-0) . F,S, Sum. Preq: PE 249.* Review basic tennis skills on grips, footwork, ground strokes, and service. Stroke production involved in more aggressive/offensive style of play: approach and volley, spin serve and kick serve. Emphasis on half-volleys, lobs, overheads, and supplemental shots. Active drills and point play situations for aggressive singles and doubles play

PE 251 Target Archery. *1(0-2-0) . F,S,Sum.* Shooting fundamentals, safety, selection, and care of equipment.

PE 252 Downhill Skiing. *1(0-2-0) . S.* Skills and techniques in downhill skiing. Emphasis on safety control, and proper equipment selection. On slope instruction held at selected ski site during semester break. Four classroom sessions on campus prior to trip. Additional cost to student approximately $200.00.

PE 253 Orienteering. *1(0-2-0) . F,S.* Navigating on foot from defined point to defined point, with use of map and compass in the shortest possible time.

PE 254 Beginning Equitation. *1(0-2-0) . F,S.* Hunt seat equitation, care of horse and tack, and control skills at the walk, trot and canter. Meets off campus once a week. Additional fee assessed.

PE 255 Basic Canoeing. *1(0-2-0) . F,S. Preq: Basic swimming ability required.* Instruction and experience in flatwater canoe skills; emphasizing paddling skills, safety, flat and moving water travel techniques and proper equipment selection. Plan and participate in one required weekend fieldtrip. Additional charge assessed forthe fieldtrip. Refer to the online schedule of classes for the current charge.

PE 256 Racquetball. *1(0-2-0) . F,S,Sum.* Skill development, strategies and rules of singles, doubles and cutthroat play.

PE 257 Backpacking. *1(0-2-0) . F,S. Preq: Must pass basic fitness test.* Designed for students with little or no backpacking experience. Safe and environmentally-sound camping practices. Equipment/clothing, first aid and safety management agencies, land navigation, and trip planning. Plan and participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to online schedule of classes for the current charge.

PE 258 Basic Rock Climbing. *1(0-2-0) . F,S,Sum.* Instruction and direct experience for the beginning rock climber. Emphasis on safe rope systems for belaying and basic movement on rock.

PE 259 Intermediate Rock Climbing. *1(0-2-0) . F,S. Preq: PE 258.* Development of intermediate rock climbing skills and practices including: climbing safety, belaying techniques, anchor systems, partner and self-rescue, rappelling and ascending techniques, minimal impact climbing, and climbing hazards. Participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

PE 260 Intermediate Equitation. *1(0-2-0) . F,S. Preq: Beginning Equitation.* Advanced techniques, theories and performance in equitation. Additional fee assessed

PE 261 Basketball. *1(0-2-0) . F,S.* Offensive and defensive skills development and systems of team work. Coverage of strategies, history and rules of the sport.

PE 262 Introduction to Whitewater Canoeing. *1(0-2-0) . F,S. Preq: PE 255. Intermediate swimming ability required.* Instruction and direct experience in fundamental whitewater canoeing skills. Basic paddling strokes and maneuvers for use on whitewater, river safety, basic river rescue, equipment selection and care, and environmental ethics. Participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

PE 263 Tap Dance. *1(0-2-0) . F,S.* Entry level dance course stressing fundamental movements of tap. Emphasis on foundation skill movements, rhythmic exercises, and the relationship of movement to music.

PE (DAN) 264 Ballet. *1(0-2-0) . F,S.* Beginning level ballet technique course. Fundamental ballet concepts and vocabulary introduced through barre and center exercises and combinations.

PE 265 Softball. *1(0-2-0) . F,S,Sum.* Basic skills, rules, and strategies for playing softball.

PE 266 Ultimate Frisbee. *1(0-2-0) . F,S.* Emphasis on skill development, aerobic fitness and spirit of competition. Includes flight dynamics, various

throwing and catching techniques, offensive skills, defensive skills, equipment, strategies, and rules of the game.

PE 267 Flag Football. *1(0-2-0) . F,S.* An introduction to the skills, history, rules and strategy of flag football.

PE 268 Advanced Clogging. *1(0-2-0) . F,S. Preq: PE 233.* Experience in advanced Appalachian clogging techniques.

PE 269 Volleyball I. *1(0-2-0) . F,S, Sum.* Volleyball fundamentals: setting, passing, serving, spiking, court movement, and game strategy.

PE 270 Volleyball II. *1(0-2-0) . F,S. Preq: PE 269.* Advanced techniques, theories and strategies of volleyball.

PE 271 Varsity Sports. *1(0-2-0) . F,S. Preq: 1 hr. of P.E. credit.* For students on a team sponsored by the Athletic Department. Course not repeatable. For student athletes on a team sponsored by the Athletic Department for one hour of Physical Education

PE 273 Jazz Dance. *1(0-2-0) . F,S.* Beginning level jazz dance technique course covering basic jazz skills in warm-up exercises, combinations, and compositions. Concentration on learning and performing combinations in jazz styles.

PE (DAN) 274 Modern Dance I. *1(0-2-0) . F,S.* Introduction of movement and dance concepts and techniques through theory and analysis, improvisation and composition, structured dance exercises combinations.

PE (DAN) 275 Modern Dance II. *1(0-2-0) . F,S. Preq: PE/DAN 274 (or permission of instructor).* Continuation of Modern Dance I. Emphasis on design of body in space, movement qualities and musicality through structured technical exercises and combinations.

PE 276 Whitewater Rafting. *1(0-2-0) . F,S,Sum. Preq: Intermediate swimming ability required.* Whitewater rafting skills and practices emphasizing safe river travel, minimal impact river camping techniques, and trip planning. Participate in two required weekend fieldtrips. Additional charge assessed for the fieldtrips. Refer to the online schedule of classes for the current charge.

PE 277 Mountain Biking. *1(0-2-0) . F,S,Sum.* Bike handling, minimal impact trail riding skills, safety, fitness, basic maintenance and repair, and equipment selection. Students must provide their own bike, helmet, protective equipment, and clothing.

PE 279 Yoga. *1(0-2-0) . F,S.* Yoga postures for all ages and levels. Breathing exercises, emphasis on physical yoga, utilizing a wide variety of postures: standing, sitting, forward bends, back bending, inverted, twisting, balances and relaxation.

PE 282 Advanced Aerobics and Leadership. *1(0-2-0) . F,S. Preq: PE 231 or PE 230.* Safe and effective high-low impact aerobics program with emphasis on student choreography and leadership, development of individual exercise prescription, and related health topics

PE 283 Mountaineering. *1(0-1-0) . S. Preq: PE 258, PE 257; Departmental approval required.* Instruction and experience in alpine climbing skills emphasizing snow and ice travel, safety, land navigation, winter hazard evaluation, minimal impact camping skills, and equipment selection. Three full-day classroom sessions before the trip required. Plan and participate in a ten-day field trip over winter break. Additional charge assessed for the field trip with a non-refundable deposit. Refer to the online schedule of classes for the current charge.

PE 284 Sea Kayaking. *1(0-2-0) . F,S. Preq: Intermediate swimming ability and Departmental approval required.* Instruction and experience in basic sea kayaking skills. Emphasis on paddling techniques, open water travel, navigation, minimal impact camping, safety, fitness, equipment selection and trip planning. Plan and participate in one required field trip.Additional charge assessed for the field trip with a non-refundable deposit. Refer to the online schedule of classes for the current charge.

PE 295 Special Topics in Physical Education. *1-3. F,S.* Examination of selected topics in health, fitness, outdoor leadership, physical education, and sport.

PE 296 Independent Study in Physical Education. *1-3. F,S,Sum.* Independent study in Physical Education will vary according to the specialized topic of interest. Credit and content determined by instructor.

COACHING

PEC 201 Coaching Baseball/Softball. *2(2-0-0) . S.* Theories, techniques, and strategies of coaching baseball/softball.

PEC 202 Coaching Basketball. *2(2-0-0) . F.* Theories, techniques, and strategies of coaching basketball.

PEC 203 Coaching Football. *2(2-0-0) . F.* Theories, techniques, and strategies of coaching football.

PEC 204 Coaching Golf. *2(2-0-0) . S.* Theories, techniques, and strategies of coaching golf.

PEC 205 Coaching Soccer. *2(2-0-0) . F.* Theories, techniques, and strategies of coaching soccer.

PEC 206 Coaching Swimming and Diving. *2(2-0-0) . S.* Theories, techniques and strategies of coaching swimming and diving.

PEC 207 Coaching Tennis. *2(2-0-0) . S.* Theories, techniques, and strategies of coaching tennis.

PEC 208 Coaching Track & Field/Cross-Country. *2(2-0-0) . S.* Theories, techniques, and strategies of coaching track and field and cross-country.

PEC 209 Coaching Volleyball. *2(2-0-0) . F.* Theories, techniques, and strategies of coaching volleyball.

PEC 211 Strength Training and Conditioning. *2(1-2-0) . F, S.* Knowledge and skills necessary for designing and implementing strength and conditioning programs. This course does not constitute credit toward meeting the minimum university Physical Education requirements

PEC 301 Coaching Practicum. *1(0-4-0) . F,S. Preq: 15 hours of PEC.* A seven-week practical coaching experience in a middle school or high school setting. Specific placement will depend upon the various playing seasons for the sports involved.

PEC 381 Athletic Training. *3(2-1-0) . F,S,Sum. Preq: PEH 280 or PEH 281 or CPR/First aid Certification.* Incidence, causes, prevention and treatment of sports-related injuries. Conditioning for sports, injury recognition and evaluation, taping techniques, first aid care, treatment and reconditioning.

PEC 477 Coaching Concepts. *3(2-1-0) . F,S,Sum.* Practical and theoretical concepts essential to the preparation of coaches. This course does not constitute credit toward meeting Physical Education requirements

PEC 478 Principles of Sports Science. *3(3-0-0) . F,S,Sum.* Basic principles of human anatomy, physiology, and biomechanics and their relationship to athletic coaching.

PEC 479 Sport Management. *3(3-0-0) . F,S,Sum.* Planning, organizing, leading, and evaluating within a sport context; fundamentals of accounting, budgeting, economics, marketing, strategic planning, ethics, and their use in sport settings; techniques of personnel, facility, and sporting event management.

FITNESS

PEF 214 Methods of Group Exercise Instruction. *2(1-2-0) . F,S. Preq: Any 100-level PE course.* A core course in teaching methods and concepts of multi-training and condition in group exercise, equipment and current rends; participation in selected activities designed to promote fitness; planning programs for physical fitness for educational institutions and social agencies. Course does not constitute credit toward meeting Physical Education GER requirement

PEF 303 Fitness Practicum. *1(2-0-0) . F,S, Preq: Consent of Instructor.* A 10 week practical fitness specialist experience in a fitness specific setting within the triangle area. Course does not constitute credit toward meeting the physical education requirement.

PEF 480 Principles of Exercise Programming. *3(3-0-0) . F. Preq: PEC 478.* Fundamentals and scientific principles necessary to plan, design, implement, and evaluate individual exercise programs.

GOLF

PEG (PRT) 210 Golf Management I. *1(2-0-0) . S. Preq: PRT 156.* Emphasis on concepts, techniques, and practices of teaching golf skills; understanding the Professional Golfers' Association Constitution; rules of golf, golf tournament operations; and golf car fleet management.

PEG 211 Golf Management II. *1(1-0-0) . F. Preq: PGM Majors, PRT/PEG 210.* Advanced concepts, techniques, and practices of teaching golf; golfer development programs, golf club design and repair.

HEALTH STUDIES

PEH 212 Alcohol, Drugs and Tobacco. *2(2-0-0) . F,S.* Theories of drug use, pharmacology, tolerance, dependence, nicotine, alcohol usage, alcoholism, sedative-hypnotics, narcotics, amphetamines, cocaine, marijuana, hallucinogens, steroids and treatment. This course does not constitute credit toward meeting the Physical Education GER requirement

PEH 213 Human Sexuality. *2(2-0-0) . F,S,Sum.* Physiological and psychosocial aspects of human sexuality. Emphasis placed on health-related topics of birth control, pregnancy, childbirth, abortion and sexually-transmitted diseases. Concepts of gender acquisition, sexual values, and sexual morality discussed as related to the promotion of healthy lifestyles within contemporary American culture.

PEH 280 Responding to Emergencies. *2(2-0-0) . F,S,Sum.* Information necessary to evaluate vital signs and bodily functions as related to emergency response; training to evaluate and react correctly to most emergency situations which might arise, and to perform temporary medical care and the follow-up action as indicated. Optional fee assessed for certification. Does not satisfy the physical education requirement

PEH 281 First Responder. *3(2-1-0) . F,S,Sum.* Knowledge and skills necessary to respond appropriately in an emergency. Advanced skills in first aid and CPR (adult, child, and infant, pocket masks and oxygen use) fulfills requirements for First Responder (depending on local protocol).

PEH 284 Women's Health Issues. *2(2-0-0) . F,S.* This course will review health and wellness issues affecting women through their life span. It will explore medical concerns and prevention as well as social health issues that disproportionately affect women in contemporary society. Discussions of current critical topics in women's health will also take place. Minor courses.

PEH 285 Personal Health. *2(2-0-0) . F,S.* Behavior change, wellness, stress management, cardiovascular diseases, alcohol and tobacco use, cancer, infectious diseases, arthritis, human sexual response, sexual assault, contraception, and sexually transmitted diseases. This course does not constitute credit toward meeting the Physical Education GER requirement

PEH 286 Nutrition, Exercise and Weight Control. *2(1-2-0) . F,S.* A nutrition, exercise and weight management program emphasizing the basics of proper nutrition and exercise. Emphasis on lifestyle changes and their relationship to appropriate weight management. Medical request

PEH 287 Stress Management. *2(2-0-0) . F,S.* Impact of stress upon the psychological and physiological function of the body. Exploration and interaction with stress management techniques. This course does not constitute credit toward meeting the Physical Education GER requirement

PEH 335 Prevention of Sexual Assault and Violence. *3(3-0-0) . F,S.* Historical and cultural perspective on rape, sexual assault, and relationship violence will be presented. The course prepares students to deliver a standard outreach program that includes statistics, definitions, risk reduction techniques, medical, legal, psychological, community and campus resources.

PEH 375 Health Planning and Programming. *2(2-0-0) . F,S. Preq: PEH 285 Personal Health.* This course is designed to assist students in developing a foundation in health programming. Students will learn the necessary skills to develop, implement, and evaluate health education programs.

PEH 377 Methods of Health Promotion. *2(2-0-0) . F, S.* This course focuses on methods and techniques for delivering health-related content to diverse populations. Cooperative learning, critical thinking, peer educator training, and decision-making will be applied to various health dimensions.

PEH 493 Practicum in Health. *2(0-0-4) . F,S. Preq: PEH 377 and 6 hours of electives from the Health Minor.* This course focuses on applying program development, management, evaluation, and educational strategies and techniques within a health-related setting.

OUTDOORS

PEO (PRT) 214 Introduction to Adventure Education. *3(3-0-0) . F.* History and philosophy, social psychology of adventure, theories of adventure, benefits, risk-taking behavior, current rends and issues, research and evaluation, and model programs. Field trip required. Students are responsible for their own transportation for field trip.

PEO (PRT) 215 Principles and Practices of Outdoor Leadership. *3(3-0-0) . S.* Principles and practices of leadership in adventure education and recreation programs: group management, trip planning, staffing, group dynamics, health and safety issues, risk management and other relevant topics.

PEO 216 Backcountry Skills and Techniques. *2(2-0-0) . S.* Skills for backcountry travel and camping. Techniques for planning, organizing and leading backcountry trips. Plan and participate in two required weekend field trips. Additional charge assessed for the field trips. Refer to the online schedule ofclasses for the current charge.

PEO 217 Challenge Course Programming. *2(1-2-0) . F,S.* Participants learn about ropes and group initiative courses; variety of adventure activities including new games, initiatives, high, and low ropes course events. Safety and risk management issues and facilitation techniques presented and discussed.Participate in one required weekend field trip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

PEO 302 Practicum Experience in Outdoor Programs. *2(0-4-0) . F,S,Sun. Preq: PEO 214, PEO 215, PEO 216, PEH 280.* Short-term, supervised opportunity for students to participate in leading an outdoor activity course or program. Integration of academic preparation with its application in a field setting.

PERSIAN

PER 101 Elementary Persian I. *3(3-0-0) . F.* Elementary Persian 101 is a beginning course for students who have little or no prior knowledge of the language. It is designed to give the students an introduction to the phonology, morphology, and script of Persian which will develop, by the end of the semester, into outcome skills including the ability to read aloud and comprehend written texts from dictation, and carry on conversations at elementary levels. A textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 102 Elementary Persian II. *3(3-0-0) . S. Preq: Elementary Persian 101 (PER 101) or instructor's permission.* Elementary Persian 102 is the second-semester continuation of Persian 101. It continues and develops the students' familiarity with and command of the written and spoken forms of the language by actively involving them in communicative activities at the first-year level. A textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 201 Intermediate Persian I. *3(3-0-0) . F. Preq: Elementary Persian 102, or instructor's permission.* Persian 201 is the third semester (beginning of second-year) in Persian. It deepens the students' familiarity with the syntax of the literary language of Persia and expands their command of the spoken vernacular of Iran through exposure to more varied and sophisticated communicational contexts. An intermediate textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 202 Intermediate Persian II. *3(3-0-0) . S. Preq: Elementary Persian (PER 201) or instructor's permission.* Persian 202 is the fourth semester, which completes the intermediate level (second year) in Persian. It further deepens the students' familiarity with the syntax of the literary language of Persia and

expands their command of the spoken vernacular of Iran through exposure to more varied and sophisticated communicational contexts. It deals principally with the acquisition of the conversation register of the language, which differs considerably from the formal written style. An intermediate textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

SPORTS

PES 291 Officiating Basketball. *1(1-0-0) . S.* Rules, interpretations, signals and mechanics of officiating basketball. Out-of-class officiating required.

PHILOSOPHY

PHI 205 Introduction to Philosophy. *3(3-0-0) . F,S.* Introduction to selected problems of enduring philosophical importance, including such topics as the nature of morality, knowledge, human freedom, and the existence of God. Content varies with different sections.

PHI 214 Issues in Business Ethics. *3(3-0-0) . F,S.* An analysis and evaluation of major issues in business ethics. Topics include the social responsibility of business; social justice and free enterprise; the rights and duties of employers, employees, manufacturers, and consumers; duties to the environment, the world's poor, future generations, and the victims of past injustices; the moral status of the corporation; and the ethics of advertising.

PHI 221 Contemporary Moral Issues. *3(3-0-0) . F, S.* Philosophical analysis and theory applied to a broad range of contemporary moral issues, including euthanasia, suicide, capital punishment, abortion, war, famine relief, and environmental concerns.

PHI 250 Practical Reasoning. *3(3-0-0) .* Analysis and criticism of both deductive and inductive argument. Deduction validity and soundness in deductive arguments; definition and the clarification of meaning; disproof by counter-example; common fallacies. Inductive arguments; polls and samples; correlations and causal connection. Conceptual and empirical theories and hypotheses. Arguments discussed with a minimum of formalization.

PHI 298 Special Topics in Philosophy. *3(3-0-0) .* Selected studies in philosophy that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

PHI 300 Ancient Philosophy. *3(3-0-0) . F. Coreq: PHI 495 for majors only.* Western philosophy of the ancient world, with special emphasis on Plato and Aristotle.

PHI 301 Early Modern Philosophy. *3(3-0-0) .* Western philosophy of the 17th and 18th centuries, including such philosophers as Descartes, Hobbes, Leibniz, Locke, Berkeley, Hume, and Kant.

PHI 302 19th Century Philosophy. *3(3-0-0) . F.* Western philosophy of the 19th century, including such philosophers as Kant, Hegel, Schopenhauer, Kierkegaard, Marx, and Nietzsche.

PHI 303 Medieval Philosophy. *3(3-0-0) . S.* Philosophy of the Middle Ages. Authors to be studied may include Augustine, Anselm, Avicenna, Maimonides, Aquinas, and Scotus.

PHI 305 Philosophy of Religion. *3(3-0-0) .* The existence and nature of God, including such topics as traditional proofs of God, skeptical challenges to religious belief, miracles, the problem of evil, faith and reason, and religious experience.

PHI 309 Contemporary Political Philosophy. *3(3-0-0) . Preq: One philosophy course.* Current theories about basic concepts in political philosophy, such as liberty, equality, justice, natural rights, and democracy, with special attention to disputes concerning the nature of a just social order.

PHI 310 Existentialism. *3(3-0-0) . F.* Philosophy of Existentialism, including such thinkers as Kierkagaard, Nietzsche, Doestoevsky, Sartre, Heidegger, and Camus.

PHI 312 Philosophy of Law. *3(3-0-0) . F.* Fundamental legal issues such as what constitutes a law or legal system. Justifications of legal interference with individual liberty. Philosophical legal issues illustrated by specific legal cases.

PHI 313 Ethical Problems in the Law. *3(3-0-0) . Preq: PHI 221, 275, or 375.* Explores uses of the legal system, including such topics as the death penalty, plea bargaining, legalizing euthanasia, censorship, Good Samaritan laws, the insanity defense, civil disobedience, preferential treatment.

PHI (STS) 325 Bio-Medical Ethics. *3(3-0-0) . F,S.* Interdisciplinary examination and appraisal of emerging ethical and social issues resulting from recent advances in the biological and medical sciences. Abortion, euthanasia, physician-assisted suicide, compromised infants, aids, reproductive technologies, and health care. Focus on factual details and value questions, fact-value questions, fact-value interplay, and questions of impact assessment and policy formation.

PHI 330 Metaphysics. *3(3-0-0) . Preq: One course in philosophy.* Metaphysical problems: distinction between appearance and reality, nature of space and time, free will and determinism, mind and body, nature of identity.

PHI 331 Philosophy of Language. *3(3-0-0) . Preq: One course in philosophy.* Introduction to traditional and modern accounts of the relations between language and reality, the nature of truth, problems of intentionality and propositional attitudes.

PHI 332 Philosophy of Psychology. *3(3-0-0) . Preq: One course in philosophy or one course in psychology.* Problems and controversies that overlap the boundary between philosophy and psychology: the mind/body problem, behaviorism vs. cognitivism, the prospects for artificial intelligence, and language and the questions of innate knowledge.

PHI 333 Theory of Knowledge. *3(3-0-0) . Preq: One course in philosophy.* Analysis of such central concepts as knowledge, belief, and truth, and the investigation of the principles by which claims to knowledge may be justified.

PHI 340 Philosophy of Science. *3(3-0-0) . F, S, Sum.* Nature of science highlighted by differences between science and pseudoscience, relationships between science and religion, and roles of purpose-directed (teleological explanation) and causal explanation in physical life and social sciences.

PHI 375 Ethics. *3(3-0-0) . F,S.* Examination of traditional questions of philosophical ethics: What are the principles of moral conduct? What sort of life is worthy of a human being? Includes both classic and contemporary literature.

PHI 376 History of Ethics. *3(3-0-0) . F,S. Preq: One course in philosophy or permission of instructor.. Coreq: PHI 494 is required for majors..* Topics in the history of ethics. Philosophers to be studied may include Plato, Aristotle, Aquinas, Butler, Hume, Kant, Sidgwick and Nietzsche.

PHI 415 Life Science Ethics. *3(3-0-0) . S. Preq: One course in PHI program.* Recent work in normative evaluation of human actions affecting living things. Advanced readings in moral theory, comparative value assessment, and public policy. Credit will not be given for both PHI 415 and PHI 515

PHI 420 Global Justice. *3(3-0-0) . S. Preq: One course in Philosophy. Coreq: PHI 494.* The applications of the ideas of justice and right beyond and across the borders of individual nation states, attending to the facts of globalization and their consequences for political and economic justice and human rights. Topics: skepticism about global justice; transnational distributive justice, pollution, and poverty; national sovereignty, self-determination, and intervention; the ethics of war; international human rights; and global democracy. No one can receive credit for both PHI 420 and PHI 520.

PHI 422 Philosophical Issues in Environmental Ethics. *3(3-0-0) . F. Preq: One course in PHI program.* Ethical questions about the environment; in particular, what obligations we have to the environment. Topics: animal rights, obligations to species and ecosystems, intrinsic vs. extrinsic value, and policy implications of moral judgments. Credit maynot be received for both PHI 422 and PHI 522. No one who has received credit for PHI 322 can receive credit for either PHI 422 or PHI 522.

PHI (PSY) 425 Introduction to Cognitive Science. *3(3-0-0) . Preq: One upper-level course in either PHI, PSY, CSC or Linguistics.* Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the

acquisition and use of language. Credit cannot be given for both PHI/PSY 425 and PHI/PSY 525

PHI 440 The Scientific Method. *3(3-0-0) . S. Preq: One upper-level course in philosophy.* Detailed examination of core issues in the philosophy of science: the confirmation of scientific theories, falsification, projectibility, the nature of scientific explanation, laws of nature, and causation. Credit cannot be given for both PHI 440 and PHI 540

PHI 445 Philosophy of Biology. *3(3-0-0) . S. Preq: One 300 or 400-level course in philosophy or biology.* Central issues in the philosophy of biology such as units of selection, philosophy of ecology, species, fitness, adaptationism, reductionism, development and innateness, evolutionary progress, and viability of applications of evolutionary theory to culture and Shuman natureS. Pre/Corequisite for following course: Corequisite for PHI 496; Credit cannot be given for both PHI 445 and PHI 545

PHI 450 Software and the Ethics of Ownership. *3(3-0-0) . S, Alt yrs(odd).* The rightness or wrongness of treating computer programs as private property, for the purposes of marketing and regulating/excluding use. Brief look at law of patent and copyright. Offered on-line only; on-campus attendance required for final exam.Credit cannot be given for both PHI 450 and PHI 550

PHI 475 Ethical Theory. *3(3-0-0) . S. Preq: PHI 375 (Ethics), or PHI 376 (History of Ethics) or permission of instructor..* An introduction to some central themes and issues in ethical theory. Topics in normative and meta-ethics such as consequentialism, deontology, virtue ethics, constructivism, realism, relativism, subjectivism, and expressivism. Readings primarily from contemporary literature.

PHI 494 Writing in Ethics. *1(1-2-0) . Preq: PHI 250, LOG 201 or 335 and one other course in philosophy. Coreq: One of PHI 221, 275, 298, 306, 309, 311, 313, 375, 422 or 498.* A substantial paper in ethics, assigned by the instructor of the corequisite.

PHI 495 Writing in History of Philosophy. *1(1-2-0) . F,S. Preq: PHI 250, LOG 201 or 335 and one other course in philosophy. Coreq: One of PHI 298, 300, 301, 302 or 498.* A substantial paper in history of philosophy, assigned by the instructor of the corequisite.

PHI 496 Writing in Contemporary Philosophy. *1(1-2-0) . Preq: PHI 250, LOG 201 or 335 and one other course in philosphy. Coreq: One of PHI 298, 305, 306, 330, 331, 332, 333, 340, 425, 440, 498.* A substantial paper in contemporary philosophy, assigned by the instructor of the corequisite.

PHI 497 Writing in Logic, Representation and Reasoning. *1(0-0-3) . F, S. Preq: LOG 201 or 335, and one other philosophy course, not PHI 250. Coreq: One of LOG 335, 435/535, PHI 298, 330, 331, 332, 333, 340, 425/525, 440/540, 445/545.* A substantial paper in logic, representation and reasoning, assigned by the instructor of the corequisite. enrollment subject to departmental approval; may be repeated for credit

PHI 498 Special Topics in Philosophy. *1-6. Preq: Six credits in PHI program.* Detailed investigation of selected topics in philosophy. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study.

PHYSICAL AND MATHEMATICAL SCIENCES

PMS 100 Perspectives on Learning. *1(1-1-0) . F.* Undergraduates in College of Physical and Mathematical Sciences. The campus computing and information environment; levels of learning; recognition and application of good reasoning; academic and career resources and opportunities.

PMS 295 Special Topics in Physical and Mathematical Sciences. *1-3. F,S,Sum. Preq: Departmental approval required.* Special topics in physical and mathematical sciences at the early undergraduate level. Available as directed individual or group study.

POULTRY SCIENCE

PO 201 Poultry Science and Production. *4(3-3-0) . F,S. Preq: BIO 125.* Fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing.

PO 290 Poultry Seminar. *1(1-0-0) . F. Preq: Sophomore standing.* Exploration of topics related with current and future potential to influence the poultry industry. Guest lectures from industry representatives will include: vertically integrated poultry production, primary breeders, marketing, animal health, veterinary medicine as it relates to poultry, allied equipment manufacturers, and management of poultry companies. Special emphasis on summer internships and career services.

PO 301 Evaluation of Live Poultry. *2(1-3-0) . S. Preq: PO 201.* Experience in evaluating live poultry for production and breeder stock potential. Emphasis on techniques and criteria used in selecting poultry for use in commercial production units.

PO (ANS, FS) 322 Muscle Foods and Eggs. *3(2-2-1) . F. Preq: ZO 160,BIO 181,BIO 183, or BIO 125.* Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante- and post-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processedmeat items.

PO (ANS, FS) 350 Introduction to HACCP. *3(3-0-0) . F,S.* Introductory course on the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants. Offered only as a world wide web course through the Office of Instructional Telecommunications.

PO 351 Grading and Evaluation of Poultry Products. *2(1-2-0) . F. Preq: PO 201.* Principles of grading and evaluation of poultry products such as dressed broilers, turkeys, shell eggs, candled eggs and broken-out eggs according to USDA guidelines.

PO 405 Avian Physiology. *4(3-3-0) . F. Preq: CH 220.* Principles of avian physiology integrating physiological functions and anatomical structures of organs and organ systems. Practical problems associated with poultry production. The importance of maximizing growth and productivity via exploitation ofenvironmental influences on physiological systems.

PO 410 Production and Management of Game Birds in Confinement. *3(2-3-0) . Preq: PO 201.* Management principles associated with the successful propagation and rearing of game birds, ornamental birds and waterfowl in confinement. Housing and pen requirements, nutrition, disease control and regulatory issues included.

PO (ANS, NTR) 415 Comparative Nutrition. *3(3-0-0) . F. Preq: CH 220 or 221 and 223.* Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.

PO 420 Turkey Production. *2(1-2-0) . S. Preq: PO 201.* Principles and current practices of turkey production.

PO 421 Commercial Egg Production. *2(1-2-0) . F,S. Preq: PO 201.* Principles and current practices of commercial egg production.

PO 422 Incubation and Hatchery Management. *2(1-2-0) . F. Preq: PO 201.* Principles and current practices of hatching egg production, incubation, and hatchery management, beginning with the placement of broiler breeder chicks on the breeder farm and ending with the placement of chicks at the brooding facility.

PO 423 Broiler Production. *2(1-2-0) . F. Preq: PO 201.* Principles and current practices of broiler production; encompassing nutrition, management, poultry health and related areas.

PO (ANS) 425 Feed Mill Management and Feed Formulation. *3(2-3-0) . S. Preq: PO(ANS,NTR) 415 or ANS 230; CH 220 or 221.* Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

PO 430 Poultry Breeding. *3(2-2-0) . S. Preq: PO 201.* Application of reproductive and genetic principles to the reproduction of poultry breeding stocks.

PO 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PO 493 Special Problems in Poultry Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PO 495 Special Topics in Poultry Science. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PLANT PATHOLOGY

PP 315 Principles of Plant Pathology. *4(3-3-0) . F. Preq: BIO 125.* Fundamental principles of plant pathology with emphasis on disease etiology, nature of pathogenesis, ecology of host/parasite interaction, epidemiology of plant diseases, current strategies and practices for integrated disease control.

PP (FOR) 318 Forest Pathology. *3(2-2-0) . S. Preq: BIO 125 or BO 200.* Major diseases of forest trees and deterioration of wood products emphasizing principles of plant pathology; diagnosis; nature, physiology, ecology, and dissemination of disease-causing agents; mechanisms of pathogenesis; epidemiology and environmental influences; principles and practices of control.

PP 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PP 493 Special Problems in Plant Pathology. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PP 495 Special Topics in Plant Pathology. *1-3. F,S,Sum.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PARKS, RECREATION AND TOURISM MANAGEMENT

PRT 150 Parks, Recreation and Tourism Management Orientation. *3(3-0-0) . F,S,Sum.* Introduction to PRTM Department, programs and facilities, the profession and opportunities in the delivery of park, recreation and tourism services. Students will complete a 30 hour field experience.

PRT 152 Introduction to Parks, Recreation and Tourism. *3(3-0-0) . F,S,Sum.* Introduction to the professional field of recreation by presenting the basic principles, fundamentals and concepts of recreation as related to such factors as recreation history and objectives, sociological and economic aspects of recreation, leadership qualities and facility provision; and settings for organized recreation in modern society.

PRT 156 Professional Golf Management Orientation. *3(3-0-0) . F. Preq: PGM Majors.* Overview of the golf industry and introduction to the concepts and practices of effective golf management including turfgrass management, golf shop operations, food & beverage control, customer services, personnel management, and tournament operations. Theoretical foundations for understanding leisure behavior and the parks, recreation and tourism management profession.

PRT 200 Leisure Behavior, Health and Wellness. *3(3-0-0) . F,S,Sum.* Leisure as a lifelong resource for human satisfaction and fulfillment; its potential for physical, mental, social and emotional growth and emotional growth and development of the individual. Leisure opportunity areas presented and evaluated.

PRT (PEG) 210 Golf Management I. *1(2-0-0) . S. Preq: PRT 156.* Emphasis on concepts, techniques, and practices of teaching golf skills; understanding the Professional Golfers' Association Constitution; rules of golf, golf tournament operations; and golf car fleet management.

PRT 211 Golf Management II. *1(1-0-0) . F. Preq: PGM Majors, PRT/PEG 210.* Advanced concepts, techniques, and practices of teaching golf; golfer development programs, golf club design and repair.

PRT (PEO) 214 Introduction to Adventure Education. *3(3-0-0) . F.* History and philosophy, social psychology of adventure, theories of adventure, benefits, risk-taking behavior, current rends and issues, research and evaluation, and model programs. Field trip required. Students are responsible for their own transportation for field trip.

PRT (PEO) 215 Principles and Practices of Outdoor Leadership. *3(3-0-0) . S.* Principles and practices of leadership in adventure education and recreation programs: group management, trip planning, staffing, group dynamics, health and safety issues, risk management and other relevant topics.

PRT 220 Commercial Recreation and Tourism Management. *3(3-0-0) . F,S. Preq: PRT 152.* Commercial recreation and the tourism industry, including its origin, present characteristics, behavioral foundations and societal impacts. Emphasis on recreation administration in the commercial sector.

PRT 238 Inclusive Recreation. *3(3-0-0) . F, S. Preq: PRT 152.* Knowledge, attitude awareness and resources needed to include people with disabilities or challenges in parks, recreation and tourism programs and services. Current legislation, issues and trends.

PRT 250 Management of Park and Recreation Facilities. *3(2-2-0) . F,S. Preq: PRT 152.* Management principles applied to park, recreation, sport areas and facilities. Emphasis on operational efficiency, quality service, fiscal responsibility and maintenance management. Laboratory provides for application of management and maintenanceprinciples.

PRT 266 Introduction to Sport Management. *3(3-0-0) . F, S, SUM.* Introduction to concepts and practices of effective sport programming and management at the professional, collegiate and community levels. Overview of various program delivery systems such as fitness, instructional sport, informal sport, and intramural sport. Examination of management elements of sport programming, including planning, personnel, finance, facilities, risk and liability and marketing.

PRT 277 Psychological & Cultural Dimensions of Sport. *3(3-0-0) . F,S. Preq: Sport Management or PRT Majors, PRT 266.* The psychological behavior of the individual in physical activity and sport. The development of sport and the sports industry, political and cultural significance of sport, and sport in international relationships. The relationship between sport, gender, class, ethnicity, health, drugs, violence, education, and life long physical activity.

PRT 286 Writing and Speaking in Sports Organizations. *3(3-0-0) . F,S. Preq: Sport Management or PRT Majors, PRT 266.* Concepts related to effective communication within sport organizations. Including interpersonal communication, group communication, public speaking, use of electronic media, and basic knowledge and understanding of media in sport and sport enterprises.

PRT 311 Golf Course Turf Grass Management. *3(2-2-0) . F. Preq: PGM Majors, Sophomore standing, PRT 211.* Introduction to the roles and responsibilities of the golf course superintendent as well as the practices and procedures associated with golf course turfgrass management. Preparation for completion of Level II Turfgrass Management, elements of the Professional Golfers' Association of America's Professional Golf Management apprentice program. Periodically class/lab meetings require transportation to area golf facilities. Students are expected to provide their own transportation accommodations.

PRT 312 Golf Management III. *1(1-0-0) . S. Preq: PGM Majors, PRT 311.* Advanced concepts, techniques, and practices of golf management: business analysis, planning and operations, and analysis of the golf swing. Preparation for completion of PGA of America's Professional golf Management Level II knowledge tests and skills simulations.

PRT 315 Organization and Administration of Adventure Programs. *3(3-0-0) . S. Preq: PRT 152.* Overview of the organizational and administration of adventure programs and services, professional standards, programming, management, staffing, budgeting, public relations, liability and risk management.

PRT 320 Convention and Visitor Services. *3(3-0-0) . F. Preq: PRT 152.* An examination of the programmatic issues of providing visitor services for conventions, meetings, group tours and special events. The focus is on the planning and delivery of visitor service programs designed to enhance visitor experiences in a community.

PRT 350 Outdoor Recreation Management. *3(2-3-0) . F, S. Preq: PRT 152.* Concepts and methods of outdoor recreation planning and management explored with emphasis on the public sector. Current issues relative to recreation provision identified and debated.

PRT 351 Outdoor Consortium. *3(2-3-0) . S.* Examines outdoor recreation and resource management approaches and research results from an applied perspective. Students will practice problem-solving techniques and interact with a wide variety of park managers and planners. This course culminatesin a week-long field experience that may conflict with other scheduled courses. Field experience held in conjunction with four other universities in the Great Smoky Mountains National Park. A fee will be assessed for the trip.

PRT 358 The Recreation Program. *3(2-3-0) . F,S. Preq: PRT 152.* Theoretical and applied approaches to the recreation program planning process. Basic elements of programming using a variety of recreational settings and diversity of practical experience.

PRT 359 Leadership and Supervision in Recreation. *3(2-2-0) . F,S. Preq: PRT 250.* Systematic principles for managing human resource component of parks, recreation and tourism organizations. Leadership, group dynamics, human resources planning and organizing, employee recruitment, selection and supervision.

PRT 365 Arts Management in Recreation. *3(2-2-0) . F. Preq: Junior standing.* Introduction to arts management in recreation programs; emphasis on the importance and benefits of arts to the individual and community. Understanding and appreciation of the role of the arts in a comprehensive recreation program plan. Emphasis on arts management principles including philosophy, fiscal, technical and physical community resources.

PRT 366 Sport Programming. *3(3-0-0) . F,S. Preq: Sport Management and PRT Majors, PRT 266.* Foundations, administrative support systems, delivery systems and desirable practices of sport programming. Program delivery systems overview with emphasis on problems and solutions associated with sport programs. Topics include sport league administration, youth sport delivery issues, sport tournament operations, community based sport delivery issues, college/university recreation sport delivery.

PRT 375 Internship Orientation. *1(0-1-0) . F. Preq: PRT 152 and Departmental approval required.* Preparation for recreation and park internship. Resume writing, interviewing skills, cover letters and internship search techniques and resources.

PRT 376 Sport Administration. *3(3-0-0) . F. Preq: Sport Management and PRT Majors, PRT 266.* Concepts related to policy development, organization and management specific to sport organizations. Including theories and practices of policy development and implementation, management theories, organizational behavior, the strategic management process, organizational design, managing change, and operational planning.

PRT 380 Analysis and Evaluation in Parks, Recreation. *3(2-2-0) . F,S. Preq: 300-level Statistics course, PRT 359.* Examination of the steps involved in analyzing and estimating the impact of recreation and parks services. Includes relevant issues and useful approaches for systematic analysis. Emphasis is placed on an understanding and development of various types of systematic evaluation designs. Activities leading to the analysis and development of performance reports to assess and improve managerial operational efficiency are covered.

PRT (BUS) 406 Sports Law. *3(3-0-0) . F. Preq: Junior standing.* Fundamental principles of law, especially tort and contract law, applied to sports situations. Analysis of liability of sports personnel in various roles including participant, coach, promoter, trainer and official. Analysis of common law court decisions in sports contexts well as key state and federal statutory legislation such as civil rights and antitrust.

PRT 407 Services, Facilities and Event Marketing. *3(3-0-0) . F,S. Preq: PRT 358.* Examination of marketing methods as applied to Parks, Recreation, Tourism and Sport Management facilities and programs. Aspects of advanced marketing: market research, marketing strategy and revenue-generation in both public and private settings. Credit will not be given for both PRT 407 and PRT 507

PRT 410 Food and Beverage Management. *3(3-0-0) . S. Preq: PGM Majors, Junior standing, PRT 312.* Introduction to practices and procedures in food and beverage service. Basics of food service needs, cost controls, legal issues affecting food and beverage service, staffing, and customer satisfaction. Critical elements of food costing, purchasing, inventory control, menu planning, and security. Preparation for completion of Level III Food and Beverage control elements of the Professional Golfers' Association of America's Professional Golf Management apprentice Program

PRT 411 Club Management. *3(3-0-0) . F. Preq: Junior standing, PRT 152.* Introduction to practices and procedures in contemporary club management. Application of general management functions to club environments including human resources, training, financial management marketing; leadership food and beverage service operations facilities and risk management; legal issues; and career planning. Preparation for completion of Club Management elements of the Professional Golfers' Association of America's Professional Golf Management apprentice Program

PRT 412 Golf Course Architecture. *3(3-0-0) . F. Preq: PRT 211.* Basic principles of golf course design. Historical architectural influences on current golf course design trends. Strategic golf course design principles, shot values, construction practices, environmental issues, and maintenance issues. Golf course design and management implications. Restricted to PGM and Landscape Arch. Majors. Junior Standing

PRT 413 Golf Management IV. *1(1-0-0) . F. Preq: PGM Majors, PRT 312, Senior standing.* Advanced concepts, techniques, and practices of golf management: swing concepts of teaching, supervising and delegating, merchandising and inventory control. Preparation for completion of PGA of America's Professional Golf Management Level III knowledge tests and skill simulations.

PRT 414 PGA Apprentice Program Completion. *0(0-0-0) . S. Preq: PGM Majors.* Checkpoint mechanism to register the successful completion of the Professional Golfers' Association Apprentice requirement.

PRT 420 Resort Planning and Management. *3(3-0-0) . S. Preq: PRT 152.* Theory and practical applications of planning, accommodations management, food and beverage operations, recreation programs and management in the resort industry.

PRT 442 Recreation and Park Interpretive Services. *3(2-3-0) . S. Preq: Junior standing.* The principles and practices of environmental and historical interpretation. Personal (attended) and non-personal (unattended) interpretive communication techniques. Comprehensive planning and implementation of interpretive programs, and equipment and facilities used in environmental and historical interpretation. One overnight field trip required.

PRT 451 Principles of Recreation Planning and Facility Development. *3(2-3-0) . F, S. Preq: PRT 358.* Planning activities analyzed as decision-making processes. Identification, interpretation, evaluation and utilization of data and resources necessary for recreation planning. Planning principles applied in the analysis of proposed and existing recreation sites.

PRT 453 Administrative Processes of Recreation/Park Organizations. *3(3-0-0) . F. Preq: PRT 359.* Basic administrative processes; the internal organization of the recreation/park department; board and executive relationships; legal foundations and legal liability considerations; personnel practices and policies; and public relations administration.

PRT 454 Parks and Recreation Finance and Administration. *3(3-0-0) . F, S. Preq: PRT 359.* Recreation and park fiscal administration, sources of finance for operating and capital expenditures, revenue activities, financial planning, budgeting, expenditure policies, auditing and planning for recreation and park services, decision-making tools, legal aspects of administration.

PRT 455 Personnel and Administrative Practices for Zoos and Aquariums. *3(3-0-0) . F.* Personnel and administrative practices identified with zoos and aquariums. Administrative philosophy and application, organizational structure, personnel management, fiscal procedures, communications, specific administrative problems.

PRT 456 Issues in Golf Management. *3(3-0-0) . S. Preq: PGM Majors, Senior standing, PRT 156.* Critical analysis of issues in professional golf management; integration of knowledge, theory and experience from course work and internship experiences; preparation for completion of the Professional Golfers' Association of America's Golf Professional Training Program.

PRT 458 Special Events Planning. *3(3-0-0) . S. Preq: PRT 358.* Theoretical and applied approaches to the planning of special events. Components and considerations of event planning, applied to various recreational settings. Participation in a community special event is required. Attendance at professional conference also required.

PRT 462 Introduction to Geographic Information Systems. *3(3-0-0) . F,S.* Overview of the operations and functions of computerized spatial display and map analysis processes (Geographic Information Systems), production of effective computer-generated maps and spatial displays, concepts for spatial modeling. Extensive independent learning and computer experiences including on-line virtual laboratory sessions.

PRT 466 Sport Finance and Economics. *3(3-0-0) . F,S. Preq: Sport Management and PRT Majors, PRT 266, ACC 210, and (ARE 201 or EC 201 or EC 205).* Concepts include sources of revenue for financing, principles of budgeting, spreadsheet utilization, and financial management of sport facilities and enterprises. Additional topics include fundraising principles and methods, economic impact principles and their application to sport venues and events, economic theory applied to sport manufacturing, service industries, professional sports, stadiums and arenas, intercollegiate sports, and the sport club industry.

PRT 475 Recreation and Park Internship. *8(0-27-0) . F,S,Sum. Preq: PRT 350, PRT 358, PRT 359, PRT 375, PRT 380, 100 hours of approved work experience..* Provides prospective park, recreation and leisure service professionals a 400-hour (ten week) learning experience in a selected agency or organization, under the joint supervision of a qualified manager and a university internship supervisor.

PRT 476 Sport Marketing. *3(3-0-0) . F,S. Preq: PRT 486, Sport Management or PRT Majors, PRT 266.* Fundamental marketing principles and concepts related to the sport industry. Overview of marketing mix, marketing strategies and the bases of segmentation, sponsorship, licensing, fundraising and merchandising. Special emphasis on the marketing of sport and its strong relationship to research. Credit will not be given for both PRT 476 and PRT 407.

PRT 477 Park, Recreation and Tourism Management. *3(3-0-0) . F,S. Preq: Senior standing.* Integration of knowledge, theory and methods from coursework and experience; development and presentation of comprehensive operational and management problems and plans. Designed to encourage students to function as professionals and to relate areas of specialty to the broader Parks, Recreation and Tourism Management profession. Must be taken during student's last semester of coursework

PRT 486 Senior Seminar in Sports Management. *3(3-0-0) . S. Preq: Sport Management Majors, Senior standing, PRT 476.* Issues affecting sport management at a national and global level. Interactive effect of strategies and decisions in each cognate area in sport management. Professional ethics and the notion of rights and responsibilities will be examined in the context of sport marketing, finance, communications, risk management and other management functions inherent in the sport enterprise. Students will also examine various theories of ethics and concepts of morality and develop a personal philosophy for social responsibility and management values.

PRT 491 Special Topics in Recreation. *1-3. F,S,Sum. Preq: Department approval required.* Investigation and analysis of a problem associated with recreation resources.

POLITICAL SCIENCE

PS 101 Internet Research. *1(0-2-0) . F,S,Sum.* Tools and techniques for conducting Internet research and electronic literature reviews. Documentation and ethics of using and citing information sources.

PS 102 Data Analysis. *1(0-2-0) . F,S,Sum.* Statistical analysis of governmental and survey data. Introduction to data sets and collecting, computerizing and analyzing political and social data.

PS 103 Designing Political Web Pages. *1(0-2-0) . F,S,Sum.* Principles of effective internet communication in political professions, for constituency contact and grassroots mobilization, and use of web documents by politicians and political organizations. Design of web page documents and creation of internet directories.

PS 200 Workshop in Political Science. *1(1-0-0) . F,S. Preq: Political Science Majors.* Core questions in political science using current political issues, events and debates as examples. Emphasis on methods of investigating political questions and the role of values in political debates.

PS 201 American Politics and Government. *3(3-0-0) . F,S,Sum.* Analysis of American political institutions and processes, including the constitution, political culture, campaigns and elections, political parties, interest groups, the media, the president, congress, the federal courts, and public policy. Discussion of contemporary and controversial issues in American politics. Emphasis on placing current issues in comparative and historical perspective where relevant.

PS 202 State and Local Government. *3(3-0-0) . F,S, Sum.* State and local governments within the context of the American federal system. Special emphasis on federalism, the constitutional/legal relationships between state and local governments, and the institutions, organizational forms, and political processes in American state and local government.

PS 203 Introduction to Nonprofits. *3(3-0-0) . F,S.* Development of nonprofit organizations and the contributions of nonprofits in the U.S., other countries, and the international community; political, social, and economic roles of nonprofits; nonprofit governance; partnerships with government and other nonprofits; types of organizations in the nonprofit sector; contemporary policy issues. Service project with minor transportation costs.

PS 204 Problems of American Democracy. *3(3-0-0) . F.* Political problems in America from the perspective of political theory. Democracy, economics and politics, racial and sexual equality, civil disobedience, and individual freedom.

PS 205 Law and Justice. *3(3-0-0) . F,S,Sum.* Role of law from practical, political and theoretical perspective; linkages between law and justice in addressing social problems, such as gun control; drug legalization; civil disobedience; gender equality; and property rights; the impact of media on public perceptions of law and justice.

PS 231 Introduction to International Relations. *3(3-0-0) . F,S,Sum.* Evolution of relations among nations and of the roles of the United Nations and other international institutions, including changes in the world political system since the end of the cold war.

PS 236 Issues in Global Politics. *3(3-0-0) . F, S.* Selected problems facing the world community, related political issues, and international responses to them, including international trade, economic development, wars, arms control, terrorism, ethnic conflict, human rights, status of women, population growth, food security, and environmental degradation.

PS 241 Introduction to Comparative Politics. *3(3-0-0) . F.* Introductory comparative analysis of a selected variety of political systems always including some developed democracies, some communist states and some developing countries. A minimum familiarity with the American political system is assumed.

PS 298 Special Topics in Political Science. *1-6.* Experimental course at the freshman and sophomore levels.

PS 301 The Presidency and Congress. *3(3-0-0) . S. Preq: PS 201.* Historical development, selection, and internal organization of the presidency and congress. Discussion of the relations between the branches and the influence of public opinion, interest groups and parties on the federal government. Analysis of the legislative process.

PS 302 Campaigns and Elections in the US Political System. *3(3-0-0) . F. Preq: PS 201.* Campaigns and elections in the United States with emphasis on presidential and congressional primary and general elections. Development of theoretical propositions concerning how and why people vote, how and why candidates campaign, and behavioral reasons underlying candidates' successes and failures. Special emphasis on the role of the mass media in the electoral process.

PS 303 Race in U.S. Politics. *3(3-0-0) . S, Alt. yr(even). Preq: Sophomore standing.* Race in American politics with emphasis on the African-American political experience: civil rights legislation, voting rights, political representation, campaigns and party politics, survey attitudes, and public policies including affirmative action.

PS 305 The Justice System in the American Political Process. *3(3-0-0) . F,S,Sum.* Criminal justice process and civil justice system in the American judiciary, including court organization and legal professionals such as police, attorneys and judges; formulation and implementation of policies by law enforcement and the courts; impact of political system upon police, attorneys and judges; interaction between public and legal professionals in judicial decision making. Students who have successfully completed PS 306 or PS 311 may not receive credit for PS 305.

PS (WGS) 306 Gender and Politics in the United States. *3(3-0-0) . S. Preq: PS 201.* This course explores the role of gender in contemporary American politics. The course examines the historical course of gender politics to see how we have arrived at the present state. It investigates the activities that women and men play in modern politics-voting, running for office, serving in office, etc., and how women and men perform these activities in different ways. The course also focuses on major areas of public policy that affect women and men in different ways.

PS 307 Introduction to Criminal Law in the United States. *3(3-0-0) . F,S.* Principles underlying the criminal law in the United States and classification of crimes, criminal act, factors affecting criminal responsibility and various types of offenses. Observation of state and federal court sessions.

PS 308 Supreme Court and Public Policy. *3(3-0-0) . S.* The role of the Supreme Court in American politics, with emphasis on the use of litigation as a form of political activity. Readings include relevant court cases as well as descriptions of the Supreme Court in action.

PS 309 Equality and Justice in United States Law. *3(3-0-0) . S, Alt yrs(odd).* Equality and justice in American law; federal and state court interpretation of constitutional and statutory law. Topics include racial justice; prisoners' rights and just punishments; nontraditional families and reproductive technologies; gay rights; immigration law; criminal justice practices.

PS 310 Public Policy. *3(3-0-0) .* Introduction to public policy formulation and analysis, including agenda-setting strategies, problems of legitimation, the appropriations process, implementation, evaluation, resolution, and termination.

PS 312 Introduction to Public Administration. *3(3-0-0) . F,S.* Administration in city, state and national governments: effectiveness and responsiveness, involvement in policy areas, and issues of ethics and responsibilities.

PS 314 Science, Technology and Public Policy. *3(3-0-0) . S.* Societal impacts of science and technology. Structures and processes for formulation, implementation, evaluation of United States science and technology policy. Political implications of selected issues in science and technology policy studies.

PS 315 Public Leadership. *3(3-0-0) . S.* Nature and varieties of political leadership by elected and appointed officials in government, officials and volunteers in nonprofit organizations, and leaders of political movements and community groups drawing on literature in political science, self-assessment of student's leadership characteristics and examination of outlets for political leadership activity.

PS 320 U.S. Environmental Law and Politics. *3(3-0-0) . F,S.* Emergence of the environment as an issue in United States politics. Law and policy pertaining to air and water pollution, land-use, water, energy, toxic substances, and wilderness. Roles of national and state governments, scientists, corporations, and citizens groups in addressing environmental problems

PS 331 U.S. Foreign Policy. *3(3-0-0) . F,S.* The content, formulation, and execution of U.S. foreign policy during the postwar period, with concentration on major issues and trends, the instruments for implementing foreign policy, and analysis of the policy-making process.

PS 335 International Law. *3(3-0-0) . S.* Purpose and effectiveness of international law, including the rights and duties of sovereign states, peaceful settlement of disputes, laws of war, humanitarian law and role of non-state actors. Emphasis on formal legal reasoning and political analysis.

PS 336 Global Environmental Politics. *3(3-0-0) . F,S.* International politics, laws, and policies pertaining to global environmental problems in the realms of population, pollution, climate change, biological diversity, forests oceans, fisheries, Antarctica, and outer space.

PS 339 Politics of the World Economy. *3(3-0-0) . S.* Politics of international trade and payments, including barriers to trade, dispute settlement, multinational corporations, financial crises, international economic institutions and the problems of economic underdevelopment.

PS 341 European Politics. *3(3-0-0) . F.* Comparative analysis of the interests, institutions and processes that determine political stability and economic security in Europe, including the political and economic development of Europe, the role of parties and party politics, the institutions and politics of the European Union.

PS 342 Politics of China and Japan. *3(3-0-0) . F,S.* Politics, public policy, and foreign affairs of China and Japan.

PS 343 Government and Politics in South Asia. *3(3-0-0) . F.* Survey of government structures, politics, foreign policies and economic policies of India, Pakistan, Bangladesh and Sri Lanka. Democratization; religious, ethnic and sectarian conflicts; nuclear proliferation; Kashmir conflict; and economic development.

PS 345 Governments and Politics in the Middle East. *3(3-0-0) .* Historical, geographic, religious, and political-economic factors of the Middle East. Particular attention is given to the internal politics of selected countries, as well as issues of international concern.

PS 361 Introduction to Political Theory. *3(3-0-0) . F,S,Sum.* Nature and purpose of politics, as treated by such writers as Plato, Aristotle, St. Augustine, Machiavelli, Locke, Rousseau, Mill, Marx, and Nietzsche.

PS 362 American Political Thought. *3(3-0-0) . S.* American ideas and institutions as viewed from the perspective of great American political thinkers, such as Frederick Douglass, Thomas Jefferson, James Madison, Alexander Hamilton, Henry David Thoreau, Abraham Lincoln, Franklin Roosevelt, and Malcolm X.

PS 371 Research Methodology of Political Science. *3(3-0-0) . F,S,Sum. Preq: ST 311 or (ST 301 and ST 302); (PS 101,PS 102, and PS 103).* Research methods in social science and quantitative analysis in political science and public policy including research design, data collection, statistical analysis and computer applications.

PS 391 Internship in Political Science. *1-6. F,S,Sum. Preq: Consent of Instructor.* Internship in a governmental agency, interest group, or like organization involves seminar or formal report.

PS 401 American Parties and Interest Groups. *3(3-0-0) . S.* American parties and interest groups as instruments for mobilizing electorates, shifting public opinion and setting political priorities. The role of parties and interest groups in operating and financing elections. Strategies, tactics and problems of parties and interest groups influencing elected officials, bureaucrats and the policy process.

PS 406 American State Politics. *3(3-0-0) .* Comparative study of the politics and policies of the fifty American states. Socioeconomic and political variations and state response to intergovernmental domestic programs. Analysis of state policy in economic development, environment, health, housing, education, transportation, criminal justice and regulation.

PS 408 Urban Politics. *3(3-0-0) .* Examination of politics in small towns, cities, counties, and urban regions including political development of cities, groups in urban politics, governmental institutions, local government officials, citizen participation, suburban development, metropolitan reform, and intergovernmental relations.

PS (AFS) 409 Black Political Participation in America. *3(3-0-0) . F.* African American political participation in the United States; political culture, socialization, and mobilization, with a focus on the interaction between African Americans and actors, institutions, processes, and policies of the American political system.

PS 411 Public Opinion and the Media in American Politics. *3(3-0-0) . Preq: PS 201.* Nature, content, origins, and effects of public opinion in the American political system; role of the mass media in articulating and shaping public opinion; issues concerning measurement of public opinion.

PS (SOC) 413 Criminal Justice Field Work. *4(2-8-0) . F,S. Preq: Acceptance in Criminal Justice Option; Senior standing; SOC 306 and PS 311.* Supervised observation and experience in a criminal justice agency. Study of relationships between ongoing programs and relevant political and sociological

theory and research. Weekly seminars, small groups, and individual conferences. Presentation of an integrative report.

PS 415 Administration of Justice. *3(3-0-0) . F. Prey: PS 311 and Junior standing.* Politics and administration in the American system of justice. Credit will not be given for both PS 415 and PA 515

PS (WGS) 418 Gender Law and Policies. *3(3-0-0) . F. Prey: Nine hours of Political Science.* Law and policy pertaining to contemporary gender issues. Examination of agenda setting, policy formation, implementation, judicial interpretation and evaluation of selected issues, such as reproductive policies, equal employment and sexual abuse.

PS 431 The United Nations and Global Order. *3(3-0-0) . F. Prey: PS 231 or PS 236 or PS 335.* United Nations in contemporary world politics. Functions and operation of central organs, commissions, and specialized agencies. Role in addressing global issues including peacekeeping, arms control, human rights, economic and social development, and environment.

PS (SOC) 432 Violence, Terrorism, and Public Policy. *3(3-0-0) . F,S. Prey: SOC 300 or PS 371.* The course examines interpersonal and group violence in contemporary societies and the causes for its occurrences. Specific forms of violence that will be examined include domestic violence, gangs, homicide, and terrorism, domestically and internationally. Throughout the course students will use data to critically evaluate policies and practices to prevent and control violence and will examine potential solutions to the problems of violence.

PS 433 Global Problems and Policies. *3(3-0-0) . F. Prey: PS 231 or PS 236 or PS 241.* Critical analysis of issues and events in world politics, including terrorism, drug trafficking and money laundering, transmission of infectious diseases, democratization, globalization and economic development.

PS 437 U.S. National Security Policy. *3(3-0-0) . Prey: PS 331.* Formulation and implementation of United States national security policy, including its military, political and economic dimensions. Historical evolution of US policy primarily from the end of World War II through the end of the Cold War and to itscontemporary context.

PS 443 Seminar in Latin American & Caribbean Politics. *3(3-0-0) . S. Prey: Six hours of Political Science including PS 231.* Comparative political development in Latin America and the Caribbean. Emphasis on democratization and implications for US foreign policy. Credit cannot be given for both PS 443 and PS 543

PS 445 Comparative Systems of Law and Justice. *3(3-0-0) . Prey: PS 311 and Junior standing.* Legal culture and administration of justice in various countries and in the U.S. Emphasis on the impact of legal ideology on crime, political justice, police administration, corrections and judicial process. Credit will not be given for both PS 445 and PS 545

PS 462 Seminar in Political Theory. *3(3-0-0) . S. Prey: PS 361 or Consent of Instructor.* A special area in political theory through selected texts, independent research, and seminar reports. Topics vary from year to year, such as ancient and modern political thought, democratic theory, and political theory in literature.

PS 463 Public Choice and Political Institutions. *3(3-0-0) . F. Prey: Junior standing or Senior standing, Political Science Majors, 12 hours of Political Science Courses.* Examination of public choice approach to political science. Analysis of political institutions and how they modify human behavior and influence political and policy outcomes. Fulfills department's undergraduate senior seminar requirement.

PS 471 Public Opinion Research Methodology. *3(3-0-0) . F,S.* Survey research methodology in public opinion polling, campaign management, media and market research, needs assessment and program evaluation. Topics include questionnaire design, survey sampling, computer applications, and data analysis.

PS 490 Readings and Research in Political Science. *1-6. F.S. Prey: Departmental approval required.* Extensive readings or research in political science under direct faculty supervision.

PS 492 Honors Readings and Thesis in Political Science. *3-6. F,S,Sum. Prey: Admission to Honors Program.* Independent reading and preparation of an honors thesis in political science.

PS 498 Special Topics in Political Science. *3-6. F,S. Prey: Six hours of Political Science.* Detailed investigation of a topic. Topic and mode of study determined by the student and a faculty member.

PSYCHOLOGY

PSY 200 Introduction to Psychology. *3(3-0-0) . F,S,Sum.* Survey of basic principles for the understanding of behavior and experience including development, learning, cognition, biological foundations, perception, motivation, personality, behavior abnormalities, measurement of individual differences, and social processes. The value of scientific observation and experimentation to the development of psychological understanding is emphasized.

PSY 201 Controversial Issues in Psychology. *3(3-0-0) . F. Prey: Freshman standing.* Students will explore contemporary controversial issues within several areas of psychology (biological, human development, cognitive processes, mental health, psychological treatment, and social psychology) and encounter the diverse approaches used by psychologists and other scientists. Students will have the opportunity to refine and use their critical thinking skills as they inquire into basic psychological concepts relevant to issues they help select and will practice confronting differing opinions responsibly and respectfully to fully contribute to and gainfully receive from the university community.

PSY 220 Orientation to Psychology. *1(1-0-0) . F.* Orientation for new or potential Psychology majors. Analysis of expectations and demands of the psychology degree programs. Exploration of the challenges and opportunities presented by various post- baccalaureate educational and career options.

PSY (ST) 240 Introduction to Behavioral Research I. *3(3-0-0) . F,S. Prey: PSY or HRD Majors, PSY 200. Coreq: PSY (ST) 241.* Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference.

PSY (ST) 241 Introduction to Behavioral Research I Lab. *1(0-2-0) . F,S. Prey: PSY or HRD Majors, PSY 200. Coreq: PSY (ST) 240.* Students design, analyze and report a variety of simple experiments.

PSY (ST) 242 Introduction to Behavioral Research II. *3(3-0-0) . F,S. Prey: PSY or HRD Majors, PSY (ST) 240. Coreq: PSY (ST) 243.* Continuation of PSY (ST) 240. Ethics of Research in Psychology. Techniques for the development of research proposals. Statistical techniques for data analysis including non-parametrics, one-way and two-way ANOVA and introduction to correlation and regression.

PSY (ST) 243 Introduction to Behavioral Research II Lab. *2(0-4-0) . F,S. Prey: PSY or HRD Majors, PSY (ST) 240. Coreq: PSY (ST) 242.* Design and analysis of a major research project.

PSY 307 Industrial and Organizational Psychology. *3(3-0-0) . F, S, Sum. Prey: PSY 200 or PSY 201, Junior standing or Senior standing.* Surveys the application of psychological theories and methods to problems involving people in working settings. Topics include: organizational and management theory; work motivation and job satisfaction; job and organizational analysis; performance evaluation; personnel recruitment, selection, and placement; and personnel training and development.

PSY 311 Social Psychology. *3(3-0-0) . F,S,Sum. Prey: PSY 200 or PSY 201.* Theory and research on how individuals respond and are responded to in social situations. Topics include attitude formation and change, affiliation, attraction, self and interpersonal perception, interpersonal relationships, aggression, helping behavior, intergroup behavior, and group dynamics.

PSY 312 Applied Psychology. *3(3-0-0) . F,S. Prey: PSY 200 or PSY 201.* Covers diverse areas of psychological practice, related methods and ethical issues. Includes illustrative cases of psychological practice in health, education, work settings, law, sports, consumer markets, and cross-cultural settings. Explores professional roles and contributions in the contexts of social, organizational and technological change.

PSY 340 Ergonomics. *3(3-0-0) . F. Prey: PSY 200 or PSY 201.* Concepts from ergonomics, environmental psychology, and cognitive psychology related through design examples to problems of everyday living. Criteria of efficiency, comfort and safety evaluated relative to the design of activity, products, and the environment. Topics include: visual and auditory perception, information

processing, physical activity, noise and lighting, work space design, workload, and product design.

PSY (AFS, MDS) 345 Psychology and the African American Experience. *3(3-0-0) . F, Alt. yrs.(odd), Preq: PSY 200 or PSY 201.* Historical and cultural examination of the psychological experiences of African American experience from pre-American times to the present. Focus on mental health, personality, identity development, racism, oppression, psychological empowerment andan African-centered world view. Discussion of contemporary issues within the African American community.

PSY 350 Human Resource Development Skills. *3(3-0-0) . F. Preq: HRD Majors, Junior standing. Coreq: PSY 495, COM 112.* Theoretical, conceptual and intervention principles of human resource development practice in public and private settings; ethics and values; individual, group and organizational behavior; assessment methods; intervention methods. Emphasis on applying principles to internship settings.

PSY 370 Personality. *3(3-0-0) . F. Preq: PSY 200.* Major personality theories. Definition of personality associated with each theory as well as the assumptions and principles used in accounting for human behavior. Theories evaluated considering recent research.

PSY 376 Developmental Psychology. *3(3-0-0) . F, S, Sum. Preq: PSY 200, PSY 201 or PSY 304 or EDP 304.* Behavioral development during the life span, including study of current theories and project work with persons at various stages of the life cycle.

PSY 400 Perception. *3(3-0-0) . F,S,Sum. Preq: PSY 200 or PSY 201, Junior standing.* Anatomy and physiology of the major sensory systems, their relationship to central structures of the brain, important and/or common pathological conditions. Basic issues and techniques of psychophysics. Perceptual phenomena and theory, with an emphasis on topics in two-and three-dimensional spatial perception, including the perceptions of size, depth and motion. Consideration of perceptual phenomena in practical settings.

PSY (WGS) 406 Psychology of Gender. *3(3-0-0) . F, S. Preq: PSY 200, PSY 201 or HSS 300.* Current theory and research on perceived and actual biological, social, cognitive, personality, and emotional similarities and differences of men and women throughout the lifespan. The construction and consequences of gender in our society and others. Credit cannot be given for both PSY 406 and PSY 506

PSY 410 Learning and Motivation. *3(3-0-0) . F. Preq: PSY 200, Junior standing.* Introduction to the primary laboratory research areas in learning and motivation: classical conditioning, operant conditioning, verbal learning, drive theory, and the role of motives. Emphasis upon research on conditioning and its motivational processes as the foundations for techniques in behavior modification. Examination of both the uses and limitations of current information on learning and motivation.

PSY 420 Cognitive Processes. *3(3-0-0) . F,S,Sum. Preq: PSY 200, Junior standing.* Introduction to research and theory in cognition, including such topics as memory, acquisition and use of language, reading, problem-solving, reasoning, and concepts.

PSY (PHI) 425 Introduction to Cognitive Science. *3(3-0-0) . F. Preq: One upper-level course in either PHI, PSY, CSC or Linguistics.* Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language.

PSY 430 Biological Psychology. *3(3-0-0) . F,S. Preq: PSY 200 and either BIO 125 or 105, Junior standing.* Biological mechanisms of behavior, including elementary neuroanatomy and neurophysiology, sensory and motor processes, and their application to motivation, learning, and psychological processes.

PSY 436 Introduction to Psychological Measurement. *3(3-0-0) . S, Alt yrs. Preq: PSY 240-241.* The basic principles of psychological measurement, including elementary statistical concepts, reliability, and validity. Emphasizes measurement in the science of psychology. Application of measurement principles to a wide variety of measurement problems.

PSY 470 Abnormal Psychology. *3(3-0-0) . S,Sum. Preq: PSY 200 or 304 or EDP 304.* Common psychological disorders of children and adults. Historical and theoretical perspectives on abnormal behavior; issues of assessment and classification, etiology, symptoms, and treatment of disorders.

PSY 475 Child Psychology. *3(3-0-0) . F,S. Preq: PSY 200 or 304 or EDP 304; PSY 376.* Theories, methods, and phenomena of child psychology and application of this information to the enhancement of child development. Multiple aspects of development, including physical, cognitive/intellectual, and social/emotional development, from conception to adolescence. Emphasis on recent research findings in developmental psychology.

PSY (EDP) 476 Psychology of Adolescent Development. *3(3-0-0) . F,S,Sum. Preq: PSY 200 or EDP 304.* Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.

PSY 491 Special Topics in Psychology. *3(3-0-0) . F,S. Preq: PSY 200.* Exploration in depth of advanced areas and topics of current interest in psychology.

PSY 495 Human Resource Development Practicum. *3-8. F,S. Preq: HRD Majors, Junior standing.* Supervised practicum in a human resource development organization during two consecutive semesters. Application of human resource development knowledge and skills.

PSY 497 Senior Seminar in Psychology. *2(0-0-2) . S. Preq: HRD or PSY Majors, Senior standing.* Readings and discussions in depth of a special topic, which integrates several fields covered in the undergraduate psychology or HRD major.

PSY 498 Psychology Honors Seminar. *3(1-4-0) . As needed. Preq: Departmental approval required, HRD and PSY honors students.* Seminar and independent study under faculty direction. Provides the undergraduate psychology honors students with an opportunity to practice skills in designing, conducting, and evaluating research. The student, working closely with a faculty advisor, designs a research approach to a particular body of literature, accumulates appropriate data, and analyzes and evaluates the data. Must take two semesters

PSY 499 Individual Study in Psychology. *1-6. F,S. Preq: Departmental approval required. Coreq: PSY 495 for HRD majors during their work semester.* Individual research project (literature review, experiment, survey, field study) open to any undergraduate, under the direction of a Psychology Department faculty member.

PHYSICS

PY 101 Perspectives on Physics. *1(1-0-0) . F. Preq: Physics Majors.* Orientation to the current practice of physics, including discussion of historical background, scientific viewpoint, current topics, and careers in physics. Visits to departmental research laboratories.

PY 123 Stellar and Galactic Astronomy. *3(3-0-0) . F,S.* Introductory, descriptive survey of stars, galaxies and cosmology, designed primarily for non-science majors. Exotic recent discoveries such as quasars, pulsars, and black holes will be included. Complements PY 124, Solar System Astronomy. Companion laboratory course PY 125.

PY 124 Solar System Astronomy. *3(3-0-0) . F,S.* Introductory, descriptive survey of the solar system designed primarily for non-science majors, including current results from space probes, history of astronomy, and the motions of the moon, stars, and planets in the night sky. Complementary course covering stars, galaxies and cosmology (PY 123). Companion laboratory course (PY 125).

PY 125 Astronomy Laboratory. *1(0-2-0) . F,S. Coreq: PY 123 or 124.* Introduction to astronomical observing. Twelve exercises include astronomical instruments; the nature of light; Kepler's and Newton's laws of motion; the constellations, planets, binary stars, stellar clusters, and galaxies. Use of small telescopes to observe celestial objects.

PY 126 Computer-based Astronomy Laboratory. *1(0-2-0) . F,S. Coreq: PY 123 or PY 124.* Ten computer-based laboratory exercises in astronomy. Celestial coordinates, motions of celestial objects, and bright stars and constellations. Simulated observing of planets, stars, and galaxies, with data reduction and analysis.

PY 131 Conceptual Physics. *4(3-2-0) . F,S,Sum.* Fundamentals of physics from a conceptual rather than a mathematical viewpoint. Applications of

physics to everyday phenomena and experiences. Numerous demonstrations and discovery-based laboratory. Mechanics, properties of matter, heat, sound, electricity and magnetism, light and relativity.

PY 133 Conceptual Physics: Optics. *4(3-2-0) . F,S.* Fundamentals of optics from a conceptual rather than a mathematical viewpoint. Applications of optics ranging from everyday phenomena to modern optical devices; from rainbows to lasers. Numerous demonstrations and discovery-based laboratory. Properties of light, color, optical devices, light in the atmosphere, vision in animals and man, light in modern physics, light in the cosmos.

PY 201 University Physics I. *4(3-2-1) . F. Coreq: MA 141.* First course of three semester sequence for students majoring in physical and mathematical sciences. Calculus used throughout. Principles of classical Newtonian mechanics covered in detail.

PY 202 University Physics II. *4(3-2-1) . S. Preq: PY 201, MA 141. Coreq: MA 241.* Second course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus used throughout. Principles of electricity and magnetism covered in detail.

PY 203 University Physics III. *4(3-2-1) . F. Preq: PY 202, MA 241. Coreq: MA 242.* Third course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus is used throughout. Principles of wave optics and modern physics are covered in detail.

PY 204 General Physics. *3(3-0-0) . Preq: MA 141.* Introduction to physics, including the study of mechanics, sound, heat, and thermodynamics. The analytical approach is employed with emphasis on problem solving. Identical to PY 205, except that there is no laboratory. Offered only through Independent Study by Extension. Credit cannot be earned for both PY 204 and PY 205

PY 205 Physics for Engineers and Scientists I. *4(3-2-0) . F,S,Sum. Preq: MA 141 with a grade of C or better.* First semester of a two-semester sequence in introductory physics, with laboratory. A calculus-based study of mechanics, sound and heat.

PY 206 General Physics Laboratory. *1(0-2-0) . F,S,Sum. Preq: PY 204.* Approximately ten experiments taken from the fields of mechanics, sound, heat and thermodynamics. Enrollment subject to approval of Physics Department. Not open to students having credit for PY 205

PY 208 Physics for Engineers and Scientists II. *4(3-1-0) . F,S,Sum. Preq: PY 205 (C or better) and MA 241 (C or better).* Second semester of a two-semester sequence in introductory physics, with coordinated laboratory problem-solving experiences. A calculus-based study of electricity, magnetism, optics and modern physics. Credit not allowed for more than one of PY 208,PY 202, and PY 212

PY 211 College Physics I. *4(3-2-0) . F,S,Sum. Preq: MA 107 or MA 111.* First semester of a two-semester introductory sequence in non-calculus physics, with laboratory. Mechanics, heat, wave motion and sound. Credit not allowed for more than one of PY 211, PY 201 or PY 205

PY 212 College Physics II. *4(3-2-0) . F,S,Sum. Preq: PY 211.* Second semester of a two-semester introductory sequence in non-calculus physics, with laboratory. Electricity, and magnetism, light, modern physics. Credit not allowed for more than one of PY 212, PY 202, and PY 208

PY 299 Special Problems in Physics. *1-3. F,S,Sum. Preq: Departmental approval required.* Study in experimental or analytical topics in classical and modern physics.

PY 328 Stellar and Galactic Astrophysics. *3(3-0-0) . S. Preq: PY 202 or PY 208.* Introduction to the study of stars, galaxies, and the universe. Stars and stellar evolution; interstellar medium; galaxies and galaxy clusters; cosmology. Recent developments in the understanding of neutron stars, black holes, active galaxies, quasars and inflationary cosmologies.

PY 341 Spacetime Physics. *3(3-0-0) . S. Preq: PY 203 or 407.* Introduction to spacetime physics in accordance with Einstein's special theory of relativity; time dilation, twin paradox, Doppler effect, relativistic space travel, four-vectors, relativistic momentum and energy conservation laws in high energy physics. Consequences of Einstein's gravitational theory in cosmology; models of the expanding universe, neutron stars, black holes and the $big bang$ hypothesis. .

PY 401 Quantum Physics I. *3(3-0-0) . F,S. Preq: PY 411.* An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.

PY 402 Quantum Physics II. *3(3-0-0) . F,S. Preq: PY 411.* An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.

PY 407 Introduction to Modern Physics. *3(3-0-0) . F,S, Sum. Preq: MA 242, PY 208.* Major developments in modern physics: special relativity, origin of the quantum theory, atomic and molecular structure, radioactivity, properties of nuclei. Credit not allowed for both PY 203 and PY 407

PY 411 Mechanics I. *3(3-0-0) . F. Preq: PY 203 or 208, MA 341.* First semester of a two-semester sequence in particle and continuum mechanics at the intermediate level. Focuses on single-particle dynamics: Elementary Newtonian mechanics, harmonic oscillator, central force motion, conservation laws, motion in non-inertial frames, Coriolis and centrifugal forces, Lagrangian dynamics, Hamilton's equations.

PY 412 Mechanics II. *3(3-0-0) . S. Preq: PY 411.* Second semester of a two-semester sequence in particle and continuum mechanics at the intermediate level. Focuses on dynamics of systems of particles and continua: Center of mass, collisions, rigid bodies, inertia tensor, principal axes, stress andstrain tensors, mechanical properties of fluids and solids; Waves in discrete and continuum systems, coupled oscillators, normal modes, elements of special relativity.

PY 413 Thermal Physics. *3(3-0-0) . S. Preq: PY 203 or 407, MA 341.* An introduction to statistical mechanics and thermodynamics. The statistical study of physical systems emphasizing the connection between the statistical description of macroscopic systems and classical thermodynamics. Concepts of heat, internal energy, temperature and entropy. Classical and quantum statistical distributions.

PY (NE) 414 Electromagnetism I. *3(3-0-0) . F. Preq: PY 203 or 208, MA 341.* First semester of a two-semester sequence. An intermediate course in electromagnetic theory using the methods of vector calculus. Electrostatic field and potential, dielectrics, solution to Laplace's and Poisson's equations, magnetic fields of steady currents.

PY (NE) 415 Electromagnetism II. *3(3-0-0) . S. Preq: PY 414.* A continuation of PY 414. Electromagnetic induction, magnetic fields in matter, Maxwell's equations, wave guides, radiation.

PY 452 Advanced Physics Laboratory. *3(1-4-0) . F,S. Preq: Senior standing, Physics Majors.* Introduction to laboratory electronics and instrumentation. Experiments in mechanics; electromagnetism; electronics; optics; and atomic, nuclear, plasma and solid state physics. Senior Physics students only

PY (MEA) 463 Fluid Physics. *3(3-1-0) . F. Preq: MA 341 and PY 208.* A derivation of the basic equations governing fluid motion in a rotating coordinate system. Equations include conservation of mass or the continuity equation, momentum equations, thermodynamic energy equation and the vorticity equation. Application of equations to simplified oceanic flows which include surface gravity waves, inertial motion, geostrophic motion, Ekman dynamics and vorticity dynamics.

PY 499 Independent Research in Physics. *1-6. F,S,Sum. Preq: Departmental approval required.* Study and research in physics. Topics for experimental or theoretical investigation.

RELIGION

REL (FLH) 101 Elementary Biblical Hebrew I. *3(3-0-0) . F,S.* The elements of grammar and syntax essential for a reading knowledge of Biblical Hebrew. Reading is drawn primarily from the Book of Genesis and some attention given to exegetical method.

REL (FLH) 102 Elementary Biblical Hebrew II. *3(3-0-0) . F,S. Preq: REL (FLH) 101.* A continuation of REL (FLH) 101 with increased emphasis upon reading selected prose passages.

REL (FLH) 201 Intermediate Biblical Hebrew I. *3(3-0-0) . F,S. Preq: REL (FLH) 102.* Continuing development of vocabulary and understanding of

grammar and syntax through reading of selected prose and poetic passages in the Hebrew Bible. Exegetical matters are considered.

REL (ELH) 202 Intermediate Biblical Hebrew II. *3(3-0-0) . F,S. Preq: REL (ELH) 201.* Exclusive attention devoted to reading and interpreting selected prose and poetic passages in the Hebrew Bible.

REL 230 South Asian Religious Traditions. *3(3-0-0) . S, Alt. Yr (even).* Hindu, Buddhist, Jain, Sikh, Islamic, Chrisitan, Jewish, and Zoroastrian religious traditions in comparative perspective. Religious and cultural history through literature, film, and art of India, Pakistan, Bangladesh, Sri Lanka, Nepal, and Afghanistan. Doctrine, practice, teaching tales, and issues of change and conflict in South Asia and in the diaspora, especially the USA.

REL 298 Special Topics in Religion. *3(3-0-0) .* Selected studies in religion that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

REL 300 Religious Traditions of the World. *3(3-0-0) . F,S,Sum.* Major Eastern and Western religious traditions with attention to their basic teachings and practices as well as to the historical, geographical, social, and political settings in which they have arisen and developed.

REL (SOC) 309 Religion and Society. *3(3-0-0) . Preq: 3 cr. in SOC, 200 level.* Religious beliefs, practices, and organizations addressed as social phenomena. Structural functionalism, conflict, and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religions to family, government and economy and to social divisions, conflict and change.

REL 311 Introduction to the Old Testament. *3(3-0-0) .* Study of Old Testament books, examining their content, background and development. Comparisons of the biblical material with other Ancient Near Eastern literature. Assessment of contributions from archeology and literary studies to clarifying the text.

REL 312 Introduction to the New Testament. *3(3-0-0) .* Literary and historical study of the New Testament in its Jewish and Greco-Roman contexts. Special attention to distinctive characteristics of the Gospels and their relationships, early controversies with Judaism and the emergence of church structure and teaching.

REL 314 Introduction to Intertestamental Literature. *3(3-0-0) .* Intertestamental literature in the context of Jewish history, institutions and beliefs of the Intertestamental Period (ca. 300 B.C.-ca. 100 A.D.)

REL 317 Christianity. *3(3-0-0) .* Development of Christianity from its origins to the present; events, persons, ideas, beliefs and practices which were most significant in this development.

REL (HI) 320 Religion in American History. *3(3-0-0) . F. Preq: 3 hours of History or Sophomore standing.* Representative people, movements and thought in the major religions within the context of American society and culture.

REL 323 Religious Cults, Sects, and Minority Faiths in America. *3(3-0-0) . F.* Religious cults, sects and minority faiths in America, including Mormonism, Christian Science and Jehovah's Witnesses. Also covers such alternate groups as the holiness-charismatic movement and the Unification Church. Origins, development and teachings of these groups within the context of American culture and religion.

REL 327 Issues in Contemporary Religion. *3(3-0-0) .* Responses of contemporary Western religious thinkers to critics of religion and to challenges posed by the 20th century including the Nazi Holocaust, social injustice (liberation theologies - black, feminist, Third World), ecological crisis, threat of nuclear warfare, and conflicts between religions.

REL 331 The Hindu Tradition. *3(3-0-0) .* Basic religio-philosophical concepts, social institutions, and individual practices of Hindu civilization from earliest Vedic times to the present. Focus on major traditions: Action (karma), Knowledge (jnana), and Devotion (bhakti), with emphasis on disciplines (yoga), myth, symbol, art.

REL 332 The Buddhist Traditions. *3(3-0-0) .* History and structure of the Buddhist tradition analyzed through the $three jewels$: the Buddha, the Monastic Community (sangha), and the Teachings (dharma). Emphasis on fundamental religio-philosophical concepts, social history and ritual practicesof Southern Buddhism, early Mahayana development, and Tantric ideals. Growth of the traditions in China and Japan.

REL 333 Chinese Religions. *3(3-0-0) . S, Alt. yrs.(odd).* Survey of Chinese religions from prehistoric times to present. Confucianism, Daoism, primary Buddhist schools in China, spirit possession, divination and popular religious worship.

REL 334 Japanese Religions. *3(3-0-0) . F, Alt. yrs.(even).* Survey of various strands of Japanese religious life from prehistoric times until present. Kami worship; primary Buddhist schools in Japan; Japanese Christianity; Confucianism; and New Religions.

REL 340 Islam. *3(3-0-0) . F.* Introductory survey of the Islamic religious tradition. Examination of the primary historical, literary, and theological sources for Islamic religious thought in global contexts. Topics include the Prophet Muhammad, the development of the early Muslim community, Islamic religious practice, Sunni and Shi'i Islam, Sufism, theology, law and Islamic art and architecture.

REL 350 Introduction to Judaism. *3(3-0-0) . S, Alt. yrs.(odd).* A survey of Jewish religious traditions from the bible through the present day. Evolution of major religious ideas through classical texts including torah, Talmud, philosophical and mystical literature, and contemporary fiction.

REL (HI) 402 Early Christianity to the Time of Eusebius. *3(3-0-0) . S, Alt. yrs.(odd). Preq: One of: REL 312, REL 317, or HI 207.* Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox Christian movements; anti-heretical writings; orthodox institutions of authority.

REL (HI) 407 Islamic History to 1798. *3(3-0-0) . Preq: 3 hours of history.* Credit will not be given for both HI 407 and HI 507. The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art and architecture, Islam in Spain, India, Asia and Africa, the Crusades, the Ottomans, Islam and Europe.

REL (HI) 408 Islam in the Modern World. *3(3-0-0) . Preq: 3 hours of history or religious studies.* Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world.

REL 412 Advanced Readings in the Christian Gospels. *3(3-0-0) . S. Preq: REL 312 or REL 317.* Close study of the varieties of gospel writings, both canonical and non-canonical, in early Christianity. Analysis of the constituent features of the gospels (parables, healing narratives, sermons), and their $pre-history$; the use of the gospels inthe reconstruction of the life and ministry of Jesus; and critical methods in gospel research.

REL 413 The Life and Letters of the Apostle Paul. *3(3-0-0) . F. Preq: REL 312 or REL 317.* Intensive study of the apostle Paul and his writings in their historical, literary and religious contexts. Sources for the life and ministry of Paul; the structure and theology of the Pauline and deutero-Pauline epistles; the influence and image of Paul in early Christianity; and contemporary controversies and issues in the study of Paul.

REL 423 Religion and Politics in 20th Century America. *3(3-0-0) . S, Alt. yrs.(odd). Preq: one 300-level course in religion, philosophy, or history.* Issues and problems in religion and politics in the United States since 1900. Historical, theoretical, sociological, and cultural approaches to religion and politics. Inquiry into the relations between religion and the state. Responses of religious traditions to American social and political issues.

REL (HI) 460 American Religion After Darwin. *3(3-0-0) . F,S. Preq: 3 credit hours in REL or HI.* Major religious issues in America from the Civil War to the mid-1920s, including science and religion, the impact of Darwin's evolutionary theory, biblical criticism, liberalism versus fundamentalism, the churches in an industrial society.

REL (STS) 471 Darwinism and Christianity. *3(3-0-0) . F, Alt. yrs. (even). Preq: One course in religious studies, biological sciences, philosophy of science, or history of science.* Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in anevolutionary world.

REL (WGS) 472 Women and Religion. *3(3-0-0) . F (Alt. yrs, odd). Preq: one course in religious studies or women's and gender studies.* Historical, literary, and theological sources dealing with portrayals of women and women's religious experience in several religious traditions of the world through different historical periods, from ancient to modern. Impact of feminist theory on the academic study of religion; methodological issues surrounding the study of women's religious history; role of religion in shaping attitudes toward women and their status in society.

REL 481 Myth, Metaphor, and Religious Imagination. *3(3-0-0) . Preq: 300-level course in REL, HI, or ENG.* Mythology from world religions; history of the academic study of mythology in 19th-20th centuries; disciplined techniques for interpretation of myth, including historical criticism, ritual study, structuralism, hermeneutics, psychoanalytic theories,Marxist and feminist criticism, and post-structural approaches; nature and role of metaphor in mythic language and religious imagination

REL 482 Religion and Conflict. *3(3-0-0) . F, (ALTYRODD). Preq: A 300 or above level Religion course.* Critical and theoretical inquiry into religious violence and nonviolence. Source materials on violence and nonviolence from histories and texts. Case studies of inter- and intra-religious conflict and violence. Conflict Resolution and role of religion in peacebuilding. Politics and public policy of religion, violence, and conflict.

REL 484 Myth and History in Religious Biography. *3(3-0-0) . Preq: 300-level course in REL, HI, or ENG.* Cross-cultural typology of religious biography, including sacred biography, hagiography, confessional biography, autobiography, and myth; structure and function of myth in creating the biographical image of religious subjects; hermeneutic theory andmethodological strategies for reading and interpreting individual life histories; multiple case-studies including Buddha, Moses, Jesus, Muhammad, Luther and Krishna-Caitanya.

REL 491 Advanced Readings in Theological and Religious Literature. *3(3-0-0) . Preq: 300-level course in Religion and consent of instructor.* Critical analysis of advanced theological works; close reading of primary texts; methods of interpretation (hermeneutics). Course may be used for individualized study programs by arrangement with the instructor

REL 496 Seminar in Religious Studies. *3(3-0-0) . Preq: 300-level course in Religion and consent of instructor.* Advanced research and writing in selected topics; application of contemporary and historical methods for the study of religion; hermeneutic theory. Open primarily to Religious Studies majors and minors

REL 498 Special Topics in Religion. *1-6. Preq: 6 hours REL.* Detailed investigation of selected topics in religion. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study programs.

SOCIOLOGY

SOC 202 Principles of Sociology. *3(3-0-0) . F,S,Sum.* Introduction to sociology. Analyses of key processes and institutions including interaction, inequality, organization, socialization, and social change. Includes core sociological concepts, methods, theories.

SOC 203 Current Social Problems. *3(3-0-0) . F,S,Sum.* Examination of social problems linked to structures of economic, political, gender and racial inequality; including poverty, disease, racism, sexism, unemployment, psychological distress, educational failure, environmental destruction and violence. Possible solutions viewed from a variety of perspectives. Includes core sociological concepts, methods and theories.

SOC (WGS) 204 Sociology of Family. *3(3-0-0) . F,S,Sum.* Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

SOC 205 Jobs and Work. *3(3-0-0) . F,S,Sum.* Work experience in terms of intrinsic and extrinsic rewards for worker. Work experience as intersection of occupation, industry, organization, region, and time period. Research skills for comparing job options to individual goals. Includes core sociological theories, concepts and methods.

SOC 206 Social Deviance. *3(3-0-0) . F,S,Sum.* Social processes in the creation and maintenance of deviant populations: classification, objectification of social meanings, functions of subcultures and social outcomes of the deviance-ascription process. Includes core sociological concepts, methods, theories.

SOC (GEO) 220 Cultural Geography. *3(3-0-0) . F,S.* Investigates the world's past and present cultural diversity by studying spatial patterns of population, language, religion, material and non-material culture, technology and livelihoods, communities and settlements and political organization and interaction.

SOC 241 Sociology of Agriculture and Rural Society. *3(3-0-0) . F,S.* Application of sociological concepts, methods, theories and styles of reasoning to major social problems facing rural America. Changing structure of agriculture; social impact of agricultural technology; rural community growth and decline; rural industrialization, rural poverty, natural resources and environmental issues in rural America. Includes core sociological concepts, methods, theories.

SOC (ANT) 261 Technology in Society and Culture. *3(3-0-0) . F,S.* Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks associated with technological innovations. Special attention to the role of scientists and engineers in socio-cultural change. Topical case studies apply course concepts and principles. Core sociological and anthropological concepts, methods, theories.

SOC 295 Special Topics in Sociology. *1-3. F, S, Sum,* Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 300 Social Research Methods. *4(3-2-0) . F,S,Sum. Preq: SOC 202. Coreq: ST 311.* Basic methods of social research, research design, sampling, data collection, measurement, and analysis; the relationship between theory and research. Laboratory exercises on computer applications.

SOC 301 Human Behavior. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* The development of personality as a consequence of social interactions and behavior of individuals in social contexts. Processes of learning, socialization, social perception, organization, stability and change of attitudes, norms, norm-formation and conformity, social roles and role strain, interpersonal attraction, and intergroup and intragroup relations.

SOC (WGS) 304 Women and Men in Society. *3(3-0-0) . F,S. Preq: 3 cr. in SOC, 200 level.* A sociological analysis of women and men in contemporary American society. Perpetuation of and change in gender stratification using sociological concepts, theories and research. How gender expectations developed and transmitted. Historical data and research on diversity in American society used for analysis of causes and consequences of gender inequality.

SOC (AFS) 305 Racial and Ethnic Relations. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Study of the nature of the relationships among racial and ethnic groups in societies around the world but with emphasis on the United States. Explores topics such as inequalities of wealth, power, and status, racism, conflict, and social boundaries among groups. Current trends in intergroup relations are discussed.

SOC 306 Criminology. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Study of processes whereby behavior is defined as crime and persons are identified as criminals. Includes a sociological investigation of agencies of law enforcement, adjudication, corrections and prevention; patterns of criminal behavior; explanations of variations in criminality with emphasis on sociocultural and sociopsychological theories.

SOC (REL) 309 Religion and Society. *3(3-0-0) . F,S. Preq: 3 cr. in SOC, 200 level.* Religious beliefs, practices and organizations addressed as social phenomena. Structural functionalism, conflict and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religions to family, government, and economy and to social divisions, conflict and change.

SOC 310 Managers, Work, and Organizations. *3(3-0-0) . F,S,Sum. Preq: Any 200-level SOC, SOC 205 recommended.* Sociological analysis of managers, who they are, and what they do. How recent changes in the U.S. economy have altered managers' work. How managers influence and adapt to the organizational environment. Relationship of management and labor in the production process.

SOC 311 Community Relationships. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Institutions, organizations and agencies found in modern communities; social problems and conditions with which they deal; their interrelationships and trends toward comprehensive planning.

SOC 342 International Development. *3(3-0-0) . F. Preq: 3 cr. in SOC, 200 level.* Sociological explanations of the causes of development and underdevelopment and origins of the present world system with emphasis on lesser developed countries. Recent global changes in the world situation including the increasing internationalization and interdependence of all countries.

SOC 351 Population and Planning. *3(3-0-0) . F. Preq: 3 credits in SOC at the 200 level.* Effects of births, deaths and migration on population size, composition and distribution. Socioeconomic and political implications of demographic change. Impact of alternative policies on demographic processes.

SOC 381 Sociology of Medicine. *3(3-0-0) . F,S. Preq: 200 level Sociology.* Use of theory and empirical studies to understand the social etiology of disease health practices, practitioners, and institutions, and the special area of mental health. Historical as well as contemporary examples of social influences on, and effects of, health throughout the world, but especially in the United States. Core sociological concepts, methods, theories.

SOC 395 Special Topics in Sociology. *1-3. F, S, Sum. Preq: 3 credits of a 200-level Sociology.* Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 400 Theories of Social Structure. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Contributions of Durkheim, Marx, Weber and others to contemporary macro-level sociological theories. Origins and development of functionalist and conflict approaches. Theories of social solidarity, class structure, the state, bureaucratization, ideology. Uses of original works.

SOC 401 Theories of Social Interaction. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC, 200 level.* Contributions of Weber, Simmel, Mead, Homans, Goffman and others to contemporary micro-level sociological theories. Origins and development of symbolic interaction, ethnomethodology, exchange theory and dramaturgy. Theories of the self, social construction of reality, emotions, interpersonal relationships. Interrelationship of theory and research; use of original works.

SOC 402 Urban Sociology. *3(3-0-0) . Preq: SOC 300.* Urban social structures emphasizing determinants and consequences of changes in urban places and life styles. Current urban problems and various approaches to urban social planning.

SOC 404 Families and Work. *3(3-0-0) . S. Preq: SOC 200 level, SOC 300.* Sociological analysis of the interplay between economy and family. How men and women make decisions regarding work and family. Theory and research techniques appropriate to the student of work/family conflicts.

SOC 405 Racism in the U.S., *3(3-0-0) . S, Alt. Yr. (even). Preq: SOC 300.* The course will examine the nature of racism in American society and its correlates: prejudice, discrimination, racial conflict, and racial oppression. Emphasis on the history and development of racism in the U.S. as well as its impact on minority groups. Sociological explanations for the emergence and continuation of racism.

SOC (WGS) 407 Sociology of Sexualities. *3(3-0-0) . S. Preq: 3 hours SOC 200 level, 300 level.* Exploration of sexuality in a social context. Relationship between sexuality, gender, and power in the U.S. Historical trends in behaviors and identities: social movements and sexual issues; current behavioral trends. Some issues covered; identity, social construction, sexual meanings.

SOC 410 Sociology of Organizations. *3(3-0-0) . Preq: 3 cr. in SOC, 200 level, SOC 300.* Application of sociological theories to study of organizational structures and processes. Special attention to control and coordination, relations with other organizations, and decision making.

SOC (PS) 413 Criminal Justice Field Work. *4(2-8-0) . F,S. Preq: SOC 306 and PS 305, Senior standing in Criminal Justice option.* Supervised observation and experience in a criminal justice agency. Study of relationships between ongoing programs and relevant political and sociological theory and research. Weekly seminars, small groups and individual conferences. Presentation of an integrative report.

SOC 414 Social Class. *3(3-0-0) . Preq: SOC 300.* The universality of social inequality, its bases and consequences. Relationship of social inequality to social class, life chances, life styles and social mobility. Theories and research methods pertinent to the study of social class.

SOC 418 Sociology of Education. *3(3-0-0) . F, Alt yrs. Preq: SOC 300.* Application of sociological theories to education, relating processes of stratification, socialization and organization. Sociological analysis of classrooms and learning. Connections of schooling with family, community and work. Cross-cultural and U.S. research.

SOC 425 Juvenile Delinquency. *3(3-0-0) . F,S,Sum. Preq: 3 cr. in SOC 200-level; SOC 300.* Nature and extent of juvenile delinquency; measurement problems; and biogenic, psychogenic and sociogenic theories of delinquency causation. Policy implications of delinquency theories for treatment and prevention. Evaluation of treatment and prevention programs.

SOC 427 Sociology of Law. *3(3-0-0) . F. Preq: 3 cr. in SOC 200-level; SOC 300.* Sociological concepts, theories and research of law as social control. Social forces behind the creation, maintenance and application of law in American Society.

SOC 428 Formal Institutions of Social Control. *3(3-0-0) . S. Preq: 3 hours SOC 200 level; SOC 300.* Development, structure and behavior of formal institutions of social control in the United States (police, courts, corrections); divergent philosophies of punishment that guide the juvenile and adult criminal justice system, dimensions of inequalitythat influence processing decisions and effectiveness of formal institutions in controlling violations of legal norms.

SOC 429 Data Analysis in Criminology. *3(3-0-0) . S. Preq: SOC 300, SOC 306, ST311.* Analysis of quantitative data in criminology. Relationship between theory and research, operationalization and measurement. Computer coding of social covariaties. Descriptive and inferential analysis. Writing research reports.

SOC 430 Community and Crime. *3(3-0-0) . S. Preq: 3 credits in SOC 200 level; SOC 300.* Neighborhood development, structure and processes as related to delinquency, crime and criminality. Divergent theories of the effect of neighborhood context on crime and crime on neighborhood processes. The interaction of person and neighborhood context. Implications of community processes for social control.

SOC (PS) 432 Violence, Terrorism, and Public Policy. *3(3-0-0) . F,S. Preq: SOC 300 or PS 371.* The course examines interpersonal and group violence in contemporary societies and the causes for its occurrences. Specific forms of violence that will be examined include domestic violence, gangs, homicide, and terrorism, domestically and internationally. Throughout the course students will use data to critically evaluate policies and practices to prevent and control violence and will examine potential solutions to the problems of violence.

SOC 440 Social Change. *3(3-0-0) . S. Preq: 3 cr. in SOC, 200 level; SOC 300.* Sources, processes and consequences of social change on macro and micro levels. Applications of classical and contemporary theories to historical and modern examples of social change in international, national, regional, community, and institutionalsettings. Examples of empirical studies and appropriate methodologies for each level of analysis.

SOC 445 Inequality, Ideology, and Social Justice. *3(3-0-0) . F. Preq: 3 hours of 200-level SOC and SOC 300.* Systematically addresses the question of why people believe what they do about the legitimacy of inequality; explores the role of self-interest, secular and religious values, considers specific types of ideology such as meritocracy, racism, sexism, colonialism; applies various theories to explain patterns of belief; looks at the role of media and propaganda in shaping beliefs.

SOC 450 Environmental Sociology. *3(3-0-0) . F, Alt yrs(odd). Preq: 3 hours SOC 200 level, SOC 300.* Systematic relations between natural environment and human societies. Dependency on the natural world. Population technology, cultural and economic influences on ecosystems. Development of environmentalism and alternative models for understanding threats and potentials, current environmental issues and considerations of their global contexts.

SOC 465 Social Aspects of Mental Health. *3(3-0-0) . S. Preq: SOC 300.* A survey of the role of social environment and life experiences in mental health and mental disorder, focusing on the link between social inequality and emotional inequality. Topics include the social construction of mental illness

and the classification process, social distribution of mental health, explanations of mental health differences. Special emphasis on adolescent and adult traumas that shape the life course.

SOC 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

SOC 493 Special Problems in Sociology. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Arrangements must be initiated by student and approved by a faculty advisor and departmental teaching coordinator.

SOC 495 Special Topics in Sociology. *1-3.* Offered as needed to present materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 498 Independent Study in Sociology. *1-6. Preq: Six hours SOC above the 200 level.* A detailed investigation of a topic in sociology. Topic and mode of study determined by the faculty member(s) in consultation with the department head.

SOIL SCIENCE

SSC 185 Land and Life. *3(3-0-0) . F.* Land quality and the social, economic and political practices of societies utilizing different land resources. The underlying physical reasons for land quality differences and land management options for technological, primitive and developing societies. Stresses macro and micro scale societal responses to land quality.

SSC 200 Soil Science. *4(3-3-0) . F,S. Preq: One semester of college chemistry.* Fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships and soil management.

SSC (BAE) 323 Water Management. *3(2-0-2) . F. Preq: Junior standing.* Water management principles applied to agriculture; hydrologic cycle, runoff, surface and sub-surface drainage, soil conservation measures to reduce erosion and sedimentation, irrigation, pond construction, open channel flow, water rights and environmental laws pertaining to water management. Emphasis on problem solving

SSC (BAE) 324 Elementary Surveying. *1(0-3-0) . F. Preq: Junior standing.* Theory and practice of plane surveying to include measuring distances as well as record keeping differential leveling, profile leveling, topographic mapping, stadia surveying and the use of these tools in agricultural applications.

SSC 332 Environmental Soil Microbiology. *3(2-3-0) . S. Preq: BIO 181 and SSC 200.* Analysis of the effects of soil environments on microbial growth. Relationships and significance of microbes to mineral transformations, plant development, and environmental quality. Management of soil microorganisms in different ecosystems.

SSC 341 Soil Fertility and Fertilizers. *3(3-0-0) . F. Preq: SSC 200, BIO 125.* Principles of managing plant nutrition for crop production, fertilizer materials, crop fertilization, soil fertility maintenance and management practices for optimizing fertilizer use; soil and plant tissue testing as diagnostic tools in nutrient management.

SSC 342 Soil Fertility Laboratory. *1(0-3-0) . F. Coreq: SSC 341.* Soil sampling and analyses for acidity and nutrient content. Calculating lime and fertilizer recommendations and calibrating fertilizer spreaders. Discussion of fertilizer materials and calculation of least cost blends. Computer programs to confirm recommendations and least cost blends. Field trip to a fertilizer distributor and to a fertilizer user.

SSC 361 Role of Soils in Environmental Management. *3(2-3-0) . S. Preq: SSC 200.* Importance of soils in land application of municipal, industrial and agricultural wastes; onsite disposal of domestic wastewater; bioremediation of contaminated sites; erosion and sedimentation control; farm nutrient management; and nonpoint sourcewater pollution.

SSC (BAE) 435 Precision Agriculture Technology. *3(2-3-0) . S, Alt. yrs(even). Preq: Junior standing or Senior standing.* Overview of technology available for implementation of a comprehensive precision agriculture program. Topics include computers, GPS, sensors, mechanized soil sampling, variable rate control system, yield monitors, and postharvest processing controls. Applications of precision agriculture in crop planning, tillage, planting, chemical applications, harvesting and postharvest processing. Credit may not be received for BAE/SSC 435 and BAE/SSC 535

SSC (BAE, CS) 440 Geographic Information Systems in Production Agriculture. *3(2-2-0) . S. Preq: SSC 341.* Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

SSC 452 Soil Classification. *4(3-4-0) . S. Preq: SSC 200.* Genesis, morphology, and classification of soils; characterization of soils according to their diagnostic properties; interpreting soil use potential; emphasis on North Carolina soils and their taxonomy; field exercise in soil mapping and site evaluation; several field trips, one overnight.

SSC 461 Soil Physical Properties and Plant Growth. *3(3-0-0) . F. Preq: SSC 200.* Soil physical properties and their influence on plant growth and environmentally sound land use; soil solid-porosity-density relationships, soil water, heat and air relations and transport. Principles and applications of these topics using current literature in agronomy, turf, horticulture, water quality, waste management and urban land use.

SSC (CS) 462 Soil-Crop Management Systems. *3(3-0-0) . S. Preq: CS 213, CS 414, SSC 342, SSC 452; senior standing.* Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical studies in planning and evaluation of soil and crop management systems.

SSC 470 Wetland Soils. *3(3-0-0) . F. Preq: SSC 200, SSC 452 recommended.* Wetland definitions, concepts, functions and regulations; chemical, physical and morphological characteristics of wetland soils. Wetland soil identification using field indicators and monitoring equipment; principles of wetland creation, restoration and mitigation. Special project required for SSC 570. Two mandatory field trips. Credit will not be given for both SSC 470 and SSC 570.

SSC 472 Forest Soils. *3(2-3-0) . S. Preq: SSC 341, or FOR 304.* Soil as a medium for tree growth; relation of soil physical, chemical and biological factors to the practice of silviculture; extensive soil management in the forest and intensive soil management in forest nurseries and in seed orchards; relation ofsoil and site to forest genetics, ecology, pathology and entomology.

SSC (CS) 490 Senior Seminar in Crop Science and Soil Science. *1(1-0-0) . S. Preq: Senior standing.* Review and discussion of current topics in crop science, soil science, agronomy and natural resource management. Preparation and presentation of scientific information in written and oral format.

SSC 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with the prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

SSC 493 Special Problems in Soil Science. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator prior to the experience.

SSC 495 Special Topics in Soil Science. *1-6. F,S. Preq: SSC 200.* Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

STATISTICS

ST 101 Statistics by Example. *3(3-0-0) .* Sampling, experimental design, tables and graphs, relationships among variables, probability, estimation, hypothesis testing. Real life examples from the social, physical and life sciences, the humanities and sports. Credit not allowed if student has prior credit for another ST course

ST (PSY) 240 Introduction to Behavioral Research I. *3(3-0-0) . F,S. Preq: PSY and HRD Majors, PSY 200. Coreq: PSY (ST) 241.* Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference.

ST (PSY) 241 Introduction to Behavioral Research I Lab. *1(0-2-0) . F,S. Preq: PSY 200, PSY and HRD Majors. Coreq: PSY (ST) 240.* Students design, analyze and report a variety of simple experiments.

ST (PSY) 242 Introduction to Behavioral Research II. *3(3-0-0) . F,S. Preq: PSY or HRD Majors, PSY (ST) 240. Coreq: PSY (ST) 243.* Continuation of PSY (ST) 240. Ethics of Research in Psychology. Techniques for the development of research proposals. Statistical techniques for data analysis including non-parametrics, one-way and two-way ANOVA and introduction to correlation and regression.

ST (PSY) 243 Introduction to Behavioral Research II Lab. *2(0-4-0) . F,S. Preq: PSY or HRD Majors, PSY (ST) 240. Coreq: PSY (ST) 242.* Design and analysis of a major research project.

ST 301 Statistical Methods I. *3(3-0-0) . Preq: MA 141 and either PMS 100 or E 115.* Contemporary description and analysis of single samples of data. Graphical data presentation methods for determination of patterns and relationships among variables. Classical and robust alternative methods for single sample data summary procedures.Probability concepts, sampling, and expectations. Confidence interval and hypothesis testing for sample mean and proportion. Computer use emphasized.

ST 302 Statistical Methods II. *3(3-1-0) . Preq: ST 301.* Confidence intervals and hypothesis testing with graphics in multiple samples and/or variables cases: tests for means/proportions of two independent groups, analysis of variance for completely randomized design, contingency table analysis, correlation, single and multiple linear regression; design of experiments with randomized blocks, factorial design and analysis of covariance. Computer use emphasized.

ST 311 Introduction to Statistics. *3(3-0-0) .* Examining relationships between two variables using graphical techniques, simple linear regression and correlation methods. Producing data using experiment design and sampling. Elementary probability and the basic notions of statistical inference including confidence interval estimation and tests of hypothesis. One and two sample t-tests, one-way analysis of variance, inference for count data and regression. Credit not allowed if student has prior credit for another ST course or BUS 350

ST (BUS, EB) 350 Economics and Business Statistics. *3(3-1-0) . F,S,Sun. Preq: MA 114; College of Management Majors must have passed Software Applications Proficiency Requirement.* Introduction to statistics applied to management, accounting, and economic problems. Emphasis on statistical estimation, inference, simple and multiple regression, and analysis of variance. Use of computers to apply statistical methods to problemsencountered in management and economics.

ST (EC) 351 Data Analysis for Economists. *3(3-0-0) . F. Preq: BUS/ST 350.* Tools for describing and analyzing data as used in economics. Probability, random variables, sampling, point and interval estimation. Hypothesis testing and regression analysis with emphasis on economic applications.

ST 361 Introduction to Statistics for Engineers. *3(3-0-0) . F,S,Sum. Preq: College algebra.* Statistical techniques useful to engineers and physical scientists. Includes elementary probability, frequency distributions, sampling variation, estimation of means and standard deviations, basic design of experiments, confidence intervals, significance tests, elementary least squares curve fitting. Credit not allowed for both ST 361 and ST 370 or ST 380

ST 370 Probability and Statistics for Engineers. *3(3-0-0) . F,S. Preq: MA 241.* Calculus-based introduction to probability and statistics with emphasis on Monte Carlo simulation and graphical display of data on computer workstations. Statistical methods include point and interval estimation of population parameters and curve and surface fitting (regression analysis). The principles of experimental design and statistical process control introduced. Credit not allowed for both ST 370 and ST 361 or ST 380

ST 371 Introduction to Probability and Distribution Theory. *3(3-0-0) . F,S,Sun. Preq: MA 241. Coreq: MA 242.* Basic concepts of probability and distribution theory for students in the physical sciences, computer science and engineering. Provides the background necessary to begin study of statistical estimation, inference, regression analysis, and analysis of variance.

ST 372 Introduction to Statistical Inference and Regression. *3(3-0-0) . F,S,Sun. Preq: ST 371.* Statistical inference and regression analysis including theory and applications. Point and interval estimation of population parameters. Hypothesis testing including use of t, chi-square and F. Simple linear regression and correlation. Introduction to multiple regression and one-way analysis of variance.

ST 380 Probability and Statistics for the Physical Sciences. *3(3-0-0) . F,S,. Preq: MA 241.* Introduction to probability models and statistics with emphasis on Monte Carlo simulation and graphical display of data on computer laboratory workstations. Statistical methods include point and interval estimation of population parameters and curveand surface fitting (regression analysis). Credit not allowed for both ST 380 and ST 361 or ST 370

ST (MA) 412 Long-Term Actuarial Models. *3(3-0-0) . F. Preq: MA 241 or MA 231. Coreq: MA 421, BUS(ST)350, ST 301, ST 311, ST 361, ST 370, ST 371, ST 380 or equivalent.* Long-term probability models for risk management systems. Theory and applications of compound interest, probability distributions of failure time random variables, present value models of future contingent cash flows, applications to insurance, health care, credit risk, environmental risk, consumer behavior and warranties.

ST (MA) 413 Short-Term Actuarial Models. *3(3-0-0) . S. Preq: MA 241 or MA 231, and one of MA 421, ST 301, ST 370, ST 371, ST 380, ST 421.* Short-term probability models for risk management systems. Frequency distributions, loss distributions, the individual risk model, the collective risk model, stochastic process models of solvency requirements, applications to insurance and businessdecisions.

ST 421 Introduction to Mathematical Statistics I. *3(3-0-0) . F. Preq: MA 242.* First of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Introduction to probability, univariate and multivariate probability distributions and their properties, distributions of functions of random variables, random samples and sampling distributions.

ST 422 Introduction to Mathematical Statistics II. *3(3-0-0) . S. Preq: ST 421.* Second of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Random samples, point and interval estimators and their properties, methods of moments, maximum likelihood, tests ofhypotheses, elements of nonparametric statistics and elements of general linear model theory.

ST 430 Introduction to Regression Analysis. *3(3-0-0) . F. Preq: ST 302, MA 305 or MA 405.* Regression analysis as a flexible statistical problem solving methodology. Matrix review; variable selection; prediction; multicolinearity; model diagnostics; dummy variables; logistic and non-linear regression. Emphasizes use of computer.

ST 431 Introduction to Experimental Design. *3(3-0-0) . S. Preq: ST 302.* Experimental design as a method for organizing analysis procedures. Completely randomized, randomized block, factorial, nested, latin squares, split-plot and incomplete block designs. Response surface and covariance adjustment procedures. Stresses use of computer.

ST 432 Introduction to Survey Sampling. *3(3-0-0) . S. Preq: ST 302.* Design principles pertaining to planning and execution of a sample survey. Simple random, stratified random, systematic and one- and two-stage cluster sampling designs. Emphasis on statistical considerations in analysis of sample survey data. Class project on design and execution of an actual sample survey.

ST 435 Statistical Methods for Quality and Productivity Improvement. *3(3-0-0) . F. Preq: ST 302.* Use of statistics for quality control and productivity improvement. Control chart calculations and graphing, process control and specification; sampling plans; and reliability. Computer use will be stressed for performing calculations and graphing.

ST 445 Introduction to Statistical Computing and Data Management. *3(3-0-0) . S. Coreq: ST 302.* Use of computers to manage, process and analyze

data. Concepts of research; data management; JCL and utility programs; use of statistical program package for data analyses and graph production; and writing statistical programs to perform simulationexperiments. Major paper required.

ST 495 Special Topics in Statistics. *1-6, F,S,Sum. Preq: Consent of Instructor.* Offered as needed to present material not normally available in regular departmental course offerings, or for offering new courses on a trial basis.

ST 498 Independent Study In Statistics. *1-6, F,S,Sum. Preq: Six hours of ST and Departmental approval required.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction.

SCIENCE, TECHNOLOGY AND SOCIETY

STS (WGS) 210 Women and Gender In Science and Technology. *3(3-0-0) . F.* Interdisciplinary introduction to the reciprocal relationships between scientific/technological research and contemporary understanding of gender. Special emphasis on social factors influencing scientists and engineers in their professions.

STS 214 Introduction to Science, Technology, and Society. *3(3-0-0) . F.* Introduction to the field of Science, Technology, and Society (STS), including most important STS scholars, major schools of thought, and important theoretical and empirical issues in STS.

STS (ARS) 257 Technology in the Arts. *3(3-0-0) . F.* The interaction between technology and the arts with an emphasis on developments in Western art of the twentieth century. Historical and emerging issues include: sound and film recordings, the addition of sound to films, the impact of films and television on theater, the impact of radio, computer applications to music, the visual arts, and literature.

STS 301 Science and Civilization. *3(3-0-0) . F,S,Sum. Preq: Sophomore standing.* An inquiry into the scientific achievement and cultural impact of three different, but interrelated, models (or paradigms) of understanding the world and man's place in it; the Ancient-Medieval model of Aristotle, Ptolemy and Aquinas; the 17th century model of Newtonian physics; and the emerging, but fragmentary, 20th century model based upon the new physics of Einstein, Planck and Heisenberg.

STS 302 Contemporary Science, Technology and Human Values. *3(3-0-0) . F,S. Preq: Sophomore standing.* Interdisciplinary evaluation of recent and potential influences of current scientific and technological developments on society. Emerging social, ethical, and intellectual issues include: The adequacy of contemporary scientific frameworks; the relations among science, technology, and society; the social consequences of scientific and technological applications, and human prospects and possibilities.

STS 303 Humans and the Environment. *3(3-0-0) . F,S.* Interactions among human populations in the biophysical system and the environment. Emphasis on current issues, ecological principles and their relationships to basic biophysical processes; considers food, population dynamics, public land and common resources, renewable natural resources, pollution, water resources, energy and non-renewable resources.

STS 304 Ethical Dimensions of Progress. *3(3-0-0) . F.* Multidisciplinary examination of traditional western notion of progress, focusing on ethical issues raised by concept of progress, and connections between science, technology and society. Places relationships such as engineering and social responsibility within the context of present day redefinitions of the notion of progress.

STS 320 Ethics in Engineering. *3(3-0-0) . S. Preq: Junior standing.* Engineering in American culture and the emerging ethical issues confronting the profession: corporate responsibility, personal rights, whistle blowing, conflicts of interest, professional autonomy, risk assessment, sustainable development, and the place and purpose of Engineering codes of ethics.

STS 322 Technological Catastrophes. *3(3-0-0) . F. Preq: Sophomore standing.* Interdisciplinary examination of the human, organizational and technical factors contributing to the causes and impacts of recent technological accidents such as the Bhopal chemical leak, the space shuttle Challenger explosion, the Chernobyl nuclearaccident, and the Exxon Valdez oil spill. Evaluation of risk assessment, risk perception and risk communication strategies. Consideration of options for living with complex technological systems.

STS 323 World Population and Food Prospects. *3(3-0-0) . S.* Examination of the dynamics of population size and food needs, production, distribution and utilization. Consequences of inadequate nutrition and food choices, efforts to increase the compatibility of effective food production systems and alternate crops and cropping systems examined.

STS 324 Alternative Futures. *3(3-0-0) . F,S.* Perspectives on possible alternative futures as well as the cutting edge of the present. Nature and likelihood of various alternatives. Methodology and limitations of forecasting, selected futurist issues and interactions between present and possible future technologies and human values.

STS (PHI) 325 Bio-Medical Ethics. *3(3-0-0) . F,S.* Interdisciplinary examination and appraisal of emerging ethical and social issues resulting from recent advances in the biological and medical sciences. Abortion, euthanasia, physician-assisted suicide, compromised infants, aids, reproductive technologies, and health care. Focus on factual details and value questions, fact-value questions, fact-value interplay, and questions of impact assessment and policy formulation.

STS 326 Technology Assessment. *3(3-0-0) . S.* Impacts of technologies as they are applied in society. Description and forecasting of effects, interactions, and potential irreversibilities.

STS 402 Peace and War in the Nuclear Age. *3(3-0-0) . S.* An interdisciplinary examination of contemporary wars and international conflict, arms, races, nuclear strategy and defense policy, arms control, theories and strategies of peace.

STS 403 Seminar in Science, technology, and Society. *3(3-0-0) . S. Preq: STS 214, STS or STB Majors.* Capstone course for the Science, Technology, and Society (STS) major. Review of the principal theoretical and empirical issues of the field. Research project focused on each student's STS specialty.

STS 405 Technology and American Culture. *3(3-0-0) . F,S,Sum.* An interdisciplinary study of the role of technology in American culture which examines the ideological, political, social, economic, and institutional contexts of technological change from the 1760's to the present, and explores the cultural impacts of new technological systems.

STS 412 Entering the 21st Century:Agricultural,Technological & Environmental Perspective. *3(3-0-0) . S, Alt. yrs.(odd).* Systems approach to predictions about the world in the 21st century from the perspectives of agricultural and environmental studies. Attention to food production, fisheries, forests, water, energy, material resources for fuel, climate, and population. Guest lectures and class projects.

STS 451 The Practice of Science and the Arts. *3(3-0-0) . F. Preq: Junior standing.* An introduction to the practice of scientists and artists in terms of the beginning of their projects, their modes of moving forward, their goals, and the nature of completeness in their work. The relation of art and science in theory and practice.

STS (REL) 471 Darwinism and Christianity. *3(3-0-0) . F, Alt. Yrs. (even). Preq: One course in religious studies, biological sciences, philosophy of science, or history of science.* Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in anevolutionary world.

STS 484 Cross Cultural Technology Transfer. *3(3-0-0) . F.* Technology transfer into cultures with different values and traditions. Special attention to the role of local and international organizations and to gender and environmental concerns. Case studies: crop science, water, energy, forest resources, banking, information technology

STS (IDS) 490 Issues in Science, Technology, and Society. *3(3-0-0) . F,S,Sum. Preq: Junior standing.* Examination of a significant issue, method, or historical episode in the area of science, technology, and society.

STS 491 Independent Study in Science, Technology, and Society. *3(3-0-0) . F,S,Sum. Preq: Consent of Instructor and Departmental approval required.* Independent investigation and discussion of a selected topic in science, technology, and society.

SOCIAL WORK

SW 201 Community Social Services. *4(3-3-0) . F,S.* Study of social services typical of American communities including services to children, families, and older persons, and services in mental health, criminal and juvenile justice, and industry. 40-hour pre-professional placement required, intern liability insurance required.

SW 290 The Development of Social Welfare and Social Work in the U.S.. *3(3-0-0) . F.* Traces the history of major policy and program development in American social welfare and the emergence and development of professional social work.

SW 300 Social Work Research Methods. *3(3-0-0) . F,S. Preq: Social Work Majors or Social Work Minors, ST 311.* Principles and methods of basic social work research. Substantive research knowledge and research methodology. Research ethics within the context of social work purposes and values. Formulation of problems for study that address the social needs of diverse groups.

SW 307 Social Welfare Policy: Analysis and Advocacy. *3(3-0-0) . S. Preq: SW 290.* Social welfare policy analysis and social work advocacy skill development. Recent changes in national and state social welfare policies and programs in major areas such as welfare, housing, health and mental health care, juvenile justice and rural development.

SW 310 Human Behavior Theory for Social Work Practice. *3(3-0-0) . S. Preq: SW 201.* Theory regarding human social functioning for students intending to practice social work. Emphasis on biological, psychological, social and cultural factors in human life.

SW 312 Multicultural Social Work. *3(3-0-0) . F,S.* Prepares students to work with diverse groups of people residing in United States, North Carolina, and globally including racial and ethnic groups and other populations defined by gender, sexual orientation, income, physical and mental ability, age and religion. Utilizing the strengths and empowerment models, emphasis is placed on defining and developing skills for culturally competent social work generalist practice through students' self-examination, experimental learning, and critical reading of class material.

SW 320 Social Work Practice I. *4(3-3-0) . F,S. Preq: Social Work Majors, SW 310.* First of a three-course sequence on generalist social work practice. Professional values, ethics, roles and interviewing skills. Includes a 40-hour pre-professional placement and intern liability insurance required.

SW 405 Social Work Practice II. *4(3-3-0) . F,S. Preq: Social Work Majors, SW 320. Coreq: SW 480/SW 408.* Second of a three-course sequence on generalist social work practice. Theory and practice methods with individuals, families and small groups. 40-hour pre-professional placement and intern liability insurance required.

SW 408 Social Work Practice III. *3(3-0-0) . F,S. Preq: Social Work Majors, SW 320. Coreq: SW 405, SW 480.* Third of three-course sequence on generalist social work practice. Theory and practice of effecting planned change in and with communities and organizations.

SW 412 Social Work in Schools. *3(3-0-0) . F,S. Preq: Nine credits in Social Work courses, including SW 320.* Models and roles relevant to school social work practice. Cooperative work with school personnel in the identification, prevention and treatment of social, emotional and behavioral problems of children and interventive techniques with parents and community groups. For individuals preparing for social work practice in the public schools and for school social workers seeking licensure.

SW 413 African American Families: History, Tradition, and Community. *3(3-0-0) . S. Alt yrs(odd). Preq: Sophomore standing.* Characteristics, traditions, history and strengths of African American families and their relationship to other social institutions, social advocacy and social policy development. African-centered worldview and relevant theory pertaining to best practice with African American families.

SW 414 Social Work Practice in Health Care. *3(3-0-0) . F,Sum Alt yrs(even). Preq: SW 201.* Practice skills and knowledge required of social workers in health care settings. Multi-disciplinary team work in health care. Social components of major illnesses and disabilities, including prevention and rehabilitation. Emotional, cultural, economic and social factors in health and illness. Health needs of specific population groups.

SW 415 Child Welfare. *3(3-0-0) . S. Preq: SW 201.* Generalist perspective on the practice of public child welfare. History of child welfare, practices in child welfare, and current trends in child welfare programs. Skills needed to practice in child protective services, adoption, and foster care with specific attention to the North Carolina child welfare system. Application of cultural diversity and cultural competency integrated throughout as it relates to child welfare issues.

SW 416 Addiction Recovery and Social Work Practice. *3(3-0-0) . F. Preq: SW 310.* Knowledge and skills in identifying Alcohol and Other Drugs (AOD) problems, screening, assessment, intervention, referral, and prevention: history of AOD problems and treatment, AOD classification, effects and signs/symptoms of AOD, models of addiction, diversity, assessment, diagnosis, intervention, treatment modalities, mutual-help groups, family dynamics, prevention, and ethical considerations. Students cannot receive credit for both SW 416 and SW 516

SW 417 Social Work and Aging. *3(3-0-0) . S,Sum,Alt Yrs.(even).* Physical, psychological, social, and cultural theories of the aging process as it relates to social work practice, social policy, and services for working with older adults and their families. Emphasis on mental and physical well-being, diversity, social and economic justice, intergenerational issues, policy and programs. Credit is not allowed for both SW 417 and SW 517

SW 420 The Legal Aspects of Social Work. *3(3-0-0) . F,S. Preq: Social Work Majors and Social Work Minors.* Legal environment of the social work profession. Relationships among legal processes, the delivery of social work services and client problems.

SW 480 Preparation for Field Work. *1(1-0-0) . F,S. Preq: Social Work Majors, SW 320. Coreq: SW 405, SW 408.* Introduction to aspects of field placement process and necessary skills for a successful internship. Application, interview, ethical practice, documentation, supervision and learning contract. Intern liability insurance required.

SW 490 Field Work in Social Services. *12(3-32-0) . F,S. Preq: Social Work Majors, SW 405, SW 408, SW 480.* Supervised placement in a social service organization; application of social work knowledge and skill. Weekly integrative seminar. Intern liability insurance required.

SW 495 Special Topics in Social Work. *3(3-0-0) . F,S,Sum.* Detailed investigation of a topic in social work. Topic and mode of study determined by faculty member.

SW 498 Independent Studies in Social Work. *1-6. F,S,Sum. Preq: Junior standing or Senior standing, Social Work Majors or Social Work Minor, Nine credits in social work courses.* Independent or small group study of a social work practice or social welfare area.

TEXTILES

T 101 Introduction to the College of Textiles. *2(2-0-0) . F.* Introduction topics related to the College of Textiles, the textile industry, all textile curricula, advising, academic skills, team work, research and personnel involved in the college.

T 102 Introduction to Product Evolution. *2(2-0-0) . F,S.* Students explore the new product development (NPD) process through analysis of case studies of how textile products are designed and developed for a variety of sectors of our economy, including automotive, medical, industrial, furniture, and clothing. Students develop critical thinking skills as they read a variety of texts and respond using several forms of writing techniques.

T 110 Textiles Scholars Forum. *0(2-0-0) . F,S. Preq: Enrollment limited to participants in the Textiles Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

T 200 Introduction to Textiles. *3(3-0-0) . S.* Survey of textiles including technical and economic history of the industry; physical and chemical processes involved in producing textile products from raw materials; unique aesthetic, physical and chemical properties of textiles and how these properties are determined by raw materials and production processes; and influence of

properties of textile materials on their utilization and performance. Not open to students required to take TT 105; open to transfer students

T 210 Textiles Scholars Forum. *0(2-0-0) . F,S. Prvq: Enrollment limited to participants in the Textiles Scholars Program.* Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

T 491 Honors Seminar in Textiles. *1(0-0-0) . F,S. Preq: By invitation into Honors Program in Textiles.* A seminar on current university and industrial research in the field of textiles.

T 493 Industrial Internship in Textiles. *3(3-0-0) . F,S,Sum. Preq: Textile core courses.* Paid professional-level work experience in textiles, relating academic training in science and technology to industrial practice under professional guidance. Written and final oral presentation used for grading. Limited to three hours per student

T 495 International Collaboration in Textiles Research. *1-6. F,S,Sum. Preq: GPA of 2.75 or better and JR standing.* Directed undergraduate research in Textiles and/or Apparel related areas that requires collaboration with students at an institution abroad. The research project is structured as an international team project in an applied field that allows students in different countries to work together using various communication tools. Students shall arrange international contacts and provide a written proposal of the project to the undergraduate administrator or course coordinator prior to registration.

T 497 Independent Research in Textile Engineering, Chemistry and Materials Science I. *3(0-9-0) . F,S,sum. Preq: Junior standing in TECS; 2.8 GPA; course coordinator's approval.* Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required.

T 498 Independent Research in Textile Engineering, Chemistry and Materials Science II. *1-3. F,S,Sum. Preq: T 497; course coordinator's approval.* Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required.

TEXTILE AND APPAREL MANAGEMENT

TAM (PD) 170 Textile Design Orientation. *1(0-2-0) . S.* Orientation course designed to present the breadth and scope of the Textile Design profession together with future opportunities in this field.

TAM 217 The Business of Textiles. *3(3-0-0) . F,S. Preq: TT 105.* Study of the structure and organization of the integrated textile complex and its strategic functions. Critical stages involved in the manufacture of textile and apparel products. Fundamental aspects of cost management and finance as related to the integrated Textile Complex. One Saturday attendance during the semester is required.

TAM 219 Fashion Product Analysis. *3(2-2-0) . F,S.* Concepts and practices for the production and evaluation of fashion goods, beginning with selection of fabric and other raw materials and extending through quality analysis of the final product. Provide techniques for production of a variety of garment applications, as well as methods for evaluation.

TAM 271 Computer-Aided Textile Design. *3(1-4-0) . S. Preq: DF 101 or ADN 111.* Introduction to the operation of design software for woven, knitted and printed textiles. Adobe Photoshop, Pointcare' and Monarch programs will be taught. Peripheral equipment essential to the design process will be included. Field trips to areatextile design centers. Credit not allowed for students enrolled in TT curriculum with the exception of the dual degree in the Bachelor of Art and Design and BS in Textile Technology.

TAM 282 Introduction to Textile Brand Management and Marketing. *3(3-0-0) . F,S. Preq: TAM 382. Coreq: TAM 382.* An introduction to the essential elements of brand management and marketing with specific reference to the marketing of textile and apparel goods with the integrated textile complex (from fiber to retail). The course covers both the principles and practice of marketing, in general, and provides an introduction of major concepts of brand management and marketing with a focus on branding activities used in by major textile and apparel firms within the integrated textile supply chain.

TAM 315 Fashion Product Design. *3(2-2-0) . F, S. Preq: TAM 217 and TAM 219.* Concepts and practices for the design and development of fashion apparel items, beginning with selection of fabric and other raw materials and extending through flat pattern development, pattern engineering, and generation of final garments. Provide techniques for development of styled patterns, which address issues of body measurements, body shape, comfort and fit.

TAM 317 Computer-Aided-Design for Apparel. *3(2-2-0) . F,S. Preq: TAM 315.* Introduction to the operation of industry design software for apparel & other sewn products. Euphoria and/or Artworks visual design programs, Gerber Accumark or Lectra pattern design programs, and other programs used by the industry to create, market and/or visualize products will be taught. Peripheral equipment essential to the design process will be included.

TAM 318 Fashion Development Processes. *3(2-2-0) . F, S. Preq: TAM 317.* The principles of apparel manufacturing including computerization of the design; marker making and production areas; spreading and cutting technology; apparel assembly systems; production systems evaluations; fusing and pressing; production capacity; and quality evaluations.

TAM 352 Dress, Style, Change. *3(3-0-0) . S. Preq: Junior standing.* Interdisciplinary course focusing on historical and cultural principles of style as related to dress and fashion. Examination of fashion and stylistic trends in cycles of dress.

TAM 380 Management and Control of Textile and Apparel Systems. *3(3-0-0) . F,S. Preq: TT 252 or TT 251 and TT 241 or TT 341.* Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.

TAM 382 Intermediate Textile Brand Management and Marketing. *3(3-0-0) . S. Preq: TAM 282, EC 201. Coreq: TAM 482.* This course builds on the introduction of the basic concepts introduced in TAM 282 by providing an in-depth examination of the major theories and concepts associated with brand management and brand marketing. Included is the identification and analysis of major strategic tools used for brand management and marketing activities by firms across the integrated textile complex. Students will be assigned practical application projects that require utilization of academic knowledge with industry application.

TAM 384 Visual Merchandising Principles and Management. *3(2-2-0) . S. Preq: Junior standing or higher, TAM 217. Coreq: TAM 382.* Study and application of techniques in the effective display of merchandise, from fiber to finished product. The focus of the course placed on the integration of textile and apparel product characteristics, target market characteristics and the latest merchandising technology and concepts.

TAM 385 Fashion and the Consumer. *3(3-0-0) . F. Preq: TAM 217, TAM 282.* This course focuses on consumer decision process for textile products, including the study of environmental, individual, psychological and marketing influences on behavior of consumers in the textile consumption process. Further examination will include influences on the process, including fashion theories, the mass media, demographics and psychographics, and societal trends. Current development and research in the textile consumer decision process are reviewed.

TAM 400 Major Fashion Designers. *3(3-0-0) . S (Alt. Yr Even).* Study of fashion designers from the early 1800s to the present. Emphasis will be placed on historical and cultural events that may have influenced the work of fashion designers during the time and trends that have emerged. Of specific interest will be major historical and current fashion designers that have had an international influence on US fashion merchandise. An additional focus of the course will be on the career path of major fashion designers. A study of haute couture and pret-a-porter will be conducted to provide insight into special management issues.

TAM (PCC, TC) 401 Environmental Aspects of the Textile Industry. *3(3-0-0) . S. Preq: Junior standing.* Environmental pollution sources and effects, occupational safety and health, and typical problems specific to the textile industry. Survey of natural and synthetic fiber pollution problems with case histories. Techniques for pollution control by source reduction and treatment. Safety and health management for hazards in the industry.

TAM (IDS) 414 Textiles and Society. *3(3-0-0) . Alt yrs. Preq: Sophomore standing.* Historical and sociological study of the textile and apparel industries

since the Middle Ages with emphasis on 1850-present. Changes in industry composition, corporate structure, production technology, work organization, and labor-management relations. Impact on communities, workers, and the environment. Long range trends and implications.

TAM 415 Fashion Product Development. *3(2-2-0) . F, S. Preq: TAM 318.* Fashion product development for specific target markets. Line production using various methods of generating patterns for mass-produced apparel with emphasis on \flat pattern\$ design techniques. Relationship of body configuration to pattern shape, specifications to garment size and fit, standards for judging fit, distinctions between ease and style fullness, and design analysis procedures are included.

TAM 416 Business of Fashion. *3(2-2-0) . F, S.* Planning and sourcing of fashion apparel products to meet the needs of the consumer. Emphasis is placed on the role of the merchandiser and merchandising function together with the measures of performance required by the fashion businesses. The interactions of the merchandiser with the functions of marketing, design, development and sourcing during pre-production are studied with respect to successful sourcing. Sourcing is studied from the requirements of compliance, product quality, cost, and manufacturing capability.

TAM 420 Retail Buying & Merchandise Management. *3(3-0-0) . F. Preq: Junior standing, TAM 382.* Introduction to the factors of the buying and selling process which affect profit at the retail level. Management of profit factors to improve profit performance in a merchandising organization. Survey of the practices, procedures, and form that track merchandising decisions and aid in planning to meet profit goals.

TAM (TT) 431 Quality Management and Control In Textile Manufacturing. *3(3-0-0) . F,S. Preq: TT 221, TT 252, TT 331, and ST 361 or BUS 350.* Principles of quality and process management and control in textile/apparel manufacturing with emphases in quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.

TAM 480 Operations Management Decisions for Textiles. *3(2-2-0) . S. Preq: TAM 380, ACC 210, ST 361, (MA 131 and MA 132) or MA 141.* Quantitative techniques for decision making and management in the textile complex. Applications include vendor selection, plant location, retail inventory management, forcasting demand, project management, and logistics planning. Techniques covered include simulation, PERT/CPM, mathematical modeling.

TAM 481 Product Costing in the Textile and Apparel Industry. *3(2-2-0) . F,S. Preq: TT 221, TT 252, TAM 217, TAM 380 & ACC 210.* Capstone course covering cost issues in yarn manufacturing, fabric formation, finishing, apparel production and retail operations. Traditional and activity-based costing systems will be addressed. Relevance of costing to managerial decisions as well as cost reduction strategies will be emphasized.

TAM (EB) 482 Advanced Textile Brand Management and Marketing. *3(3-0-0) . S. Preq: TAM 382.* An applied textile marketing course that integrates textile product development, brand management, and global marketing. This course provides an overview of the global textile and apparel industries, their distribution channels and markets---with positioning the US textile, apparel, and retail industries in the global competitive environment. The course includes diverse textile end uses, including apparel, nonwovens, home textiles, transportation textiles and medical textiles. Development and implementation strategies of launching textile products in the global marketplace are analyzed.

TAM 483 Global Trade and Sourcing in Textiles and Apparel. *3(3-0-0) . S. Preq: TAM 282,EC201.* This course provides students with an understanding and appreciation of the global textile and apparel market. Included is the explanation and guidance in understanding the uniqueness of textile and apparel regulations in global trade. Students willlearn global sourcing strategies and the identification and analysis of major strategic decisions used in global sourcing, as impacted by global trade dynamics. Students will be assigned practical application projects that require utilization of academic knowledge with industry application.

TAM 484 Management Decision Making for the Textile Firm. *3(3-0-0) . F,S. Preq: TAM and EC 201 or ARE 201 or EC 205.* Economic, institutional and environmental settings within which management decisions are made, including in-depth analyses of specific issues and problem areas affecting the textile industry. Special emphasis on strategic management and topics of current interest and significance.

TAM 485 Textile Computer Integrated Enterprise. *3(3-0-0) . F. Preq: TAM 380.* Survey of information technology in textile and apparel industries. Topics discussed include: computer aided design (CAD); computer aided manufacturing (CAM); computer aided engineering (CAE); material handling systems; automation and robotics; logistics and warehousing systems; retail product tracking, and Internet resources.

TAM 486 Supply Chain Management in the Textile Industry. *3(3-0-0) . S. Preq: TAM 380.* Study of the operations necessary to produce and distribute a product, starting with the procurement of the raw material used in making the goods and ending with the delivery of the finished product. Topics covered include approaches to solving problems in manufacturing, sourcing, transportation logistics, and retail operations within the Integrated Textile Complex. Credit cannot be given for both TAM486 and MT386

TAM 487 Textile and Apparel Labor Management. *3(3-0-0) . F. Preq: Senior standing.* Labor management problems. Emphasis directed toward role of production supervision in textile and apparel plants. Study of NLRB decisions and court opinions involving textile and apparel corporations.

TAM 490 Development Projects in Textile and Apparel Management. *1-3. F,S,Sum. Preq: Junior standing and 2.75 GPA.* Directed research in Textile and Apparel Management through experimental, theoretical and literature studies in textile and apparel-related problems. Courses may be taken twice provided projects are different subject matter.

TAM 491 Special Topics in Textile and Apparel Management. *1-3. F,S. Preq: Senior standing.* Special topics related to textile and apparel management.

TAM 494 International Industrial Internship in Textile Management. *3(3-0-0) . F,S,Sum. Preq: At least FL 202 for internships in non-English speaking countries, Minimum GPA 2.5, Junior standing.* Professional level work experience in textile management abroad, relating academic training, international textile management and technology to industrial practice under professional guidance. Grading based on written report and oral presentation.

TAM (TT) 499 Textile Senior Project. *4(2-4-0) . F,S. Preq: Senior standing.* This is a project based course to be taken in the last semester of the Senior year. In this capstone course the students work in cross-functional teams to research and solve applied problems in textile related fields. The results of the projects will be presented formally at the end of the semester. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses

TEXTILE ENGINEERING

TE 105 Textile Engineering: Materials and Systems. *2(2-0-0) . S. Coreq: CH 101.* Introducation to textile engineering, polymers and fibers with emphasis on applications. Discussions of what makes macromolecules unique and pairing of material properties to a given application. Other discussions by various TE faculty giving students a picture of the breadth of the program. This course will also help develop leadership/team work skills and oral/written communications.

TE (IE) 110 Computer-Based Modeling for Engineers. *3(3-0-0) . F,S. Preq: E 115. Coreq: MA 141.* Introductory course in computer-based modeling and programming using Visual Basic for Applications. Emphasis on algorithm development and engineering problem solving. Methodical development of VBA within applications like Microsoft Excel and Access from specifications; documentation, style; control structures; classes and methods; data types and data abstraction; object-oriented programming and design; graphical user interface design. Projects: design problems from electrical, industrial, textile, and financial systems. Functional relationships will be given and programs will be designed and developed from a list of specifications.

TE 200 Introduction to Polymer Science and Engineering. *3(3-0-0) . F. Preq: CH 101.* Science and engineering of large molecules. Correlation of molecular structure and properties of polymers in solution and in bulk. Introductory polymer synthesis and kinetics. Analysis of physical methods for characterization of molecular weight, morphology, rheology, and mechanical behavior. The content will be focused on polymer synthesis, structure, and properties. The course will focus on a thorough understanding of polymer concepts and definitions, equations to calculate properties, and equipment used to measure properties.

TE 201 Textile Engineering Science. *4(3-2-0) . S. Preq: MA 241, PY 205 and CSC 114 or CSC 116.* Structure, physical and mechanical properties of fibers; structure of assemblies. Structure/property relations. Laboratory exercises in characterization of fiber properties.

TE 205 Analog and Digital Circuits. *4(3-2-0) . S. Preq: TE 110, PY 208. Coreq: MA 341.* Fundamentals of analog and digital circuit analysis and design. The course will present the systematic analysis and design of AC and DC circuits using Ohms and Kirchhoff's laws, the node voltage method, Thevenin and Norton's theorem, Laplace Transforms, resistance, capacitance, inductance, operational amplifiers, and frequency response. Next, the design of combinatorial and synchronous sequential circuit design will be covered using Karnaugh maps, laws of Boolean algebra, flip-flops, state machines, and latches. Laboratory exercises will supplement the topics presented in class.

TE 301 Engineering Textile Structures I: Linear Assemblies. *3(3-0-0) . F. Preq: (MAE 206 or CE 214) and MA 242.* Engineering analysis of textile structures, especially yarns. Unit processes of production, handling and packaging. Production sequences, intermachine effects, machine design and their consequences on the textile product.

TE 302 Textile Manufacturing Processes and Systems II. *4(3-2-0) . Preq: TE 301, CSC 114.* Mechanisms used in the production of woven, knitted and nonwoven fabrics. Design and operation of these mechanisms and their impact on the fabric. System dynamics of the different fabric forming processes.

TE 303 Thermodynamics for Textile Engineers. *3(3-0-0) . F. Preq: MA 242, PY 208.* Introduction to the concept of energy and the laws governing the transfer and transformation of energy with an emphasis on thermodynamic properties and the First and Second Laws of Thermodynamics. The fundamentals of thermodynamics will be emphasized, although more applied examples and problems will be heavily utilized.

TE 401 Textile Engineering Design I. *4(3-2-0) . Preq: TE 302.* The design process including initial specification, design constraints, sources of information and design strategy. Development of fact-finding ability in areas unfamiliar to the student. Analysis of existing designs and the development of improved or new designs.

TE 402 Textile Engineering Design II. *4(2-4-0) . Preq: TE 401.* Application of textile engineering principles using team approach to design, construct and analyze novel engineering solutions to textile industry problems. Evaluation of design to assess the impact on worker, industry and society.

TE 403 Mechanics of Fibrous Structures. *3(3-0-0) . Preq: TE 201, TE 302, MA 341, MAE 314.* Mechanics of fibrous structures including fibers, yarns and fabrics. Transverse isotropy of fibers; tensile, bending, and shear behavior of fabrics.

TE 404 Textile Engineering Quality Improvement. *3(3-0-0) . Preq: ST 370, TE 302.* Defining and quantifying quality of textile products; quality improvement using statistical process control (SPC) and design of experiment (DOE) techniques.

TE 424 Textile Engineering Quality Improvement Laboratory. *1(0-2-0) . S. Coreq: TE 404.* Application of process improvement methods to textile systems using statistical software. Laboratory supplements lecture material presented in TE 404.

TE (CHE) 435 Process Systems Analysis and Control. *3(3-0-1) . F,S. Preq: (MA 341 and TE 205) or CHE 312.* Dynamic analysis and continuous control of chemical and material engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

TE 440 Textile Information Systems Design. *4(3-3-0) . F. Preq: TE 435.* Textile information system design, real-world constraints. Principles of hardware, software, security and ethics issues. Emphasis on solving a real world problem.

TE 463 Polymer Engineering. *3(3-0-0) . F. Preq: TE 201. Coreq: TE 303.* Chemical and physical properties of polymers and fibers; thermodynamics of crystallization, time dependent phenomena, fracture mechanics and rheology. Advanced topics in extrusion.

TE 466 Polymeric Biomaterials Engineering. *3(3-0-0) . F. Preq: PY 208; TC 203 or CH 220 or 221; MAE 206.* In-depth study of the engineering design of biomedical polymers and implants. Polymeric biomaterials, including polymer synthesis and structure, polymer properties as related to designing orthopedic and vascular grafts. Designing textile products as biomaterials including surface modification and characterization techniques. Bioresorbable polymers.

TE (BME) 467 Mechanics of Tissues & Implants Requirements. *3(3-0-0) . S. Preq: ZO 160 or BIO 181; MAE 314.* Application of engineering and biological principles to understand the structure and performance of tendons, ligaments, skin, and bone; bone mechanics; viscoelasticity of soft biological tissues; models of soft biological tissues; mechanics of skeletal muscle; and tissue-derived devices as well as interfaces between native tissues and synthetic devices.

TE 492 Special Topics in Textile Engineering. *1-3. F,S. Preq: Consent of Instructor.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

TECHNOLOGY EDUCATION

TED 101 Introduction to Technology Education. *1(1-0-0) . F.* Orientation to technology teacher education curricula. Overview of the philosophy, objectives and scope of technology education programs in the public schools, multicultural and individual differences of students. A study of current technology issues will be conducted throughout the course.

TED 110 Materials & Processes Technology. *4(2-4-0) . F,S.* Basic knowledge and skills needed to process common materials and produce functional products of woods, metals, plastics, and composite materials. Includes laboratory safety, use of hand tools, operation of materials, and teaching strategies. Laboratory experiences in materials testing and construction of multi-material projects.

TED 115 Wood Processing. *4(2-4-0) . F,S.* Basic knowledge and skills needed to design and construct functional wood products. Includes a study of tools, materials and processes used to machine, form, assemble and finish wood products. Laboratory activities in the design and construction of wood products. Teaching techniques are discussed.

TED 122 Metals Technology. *4(2-4-0) . F,S.* Introduction to metal layout, cutting, machining, forming, fabricating, finishing processes, and current technologies including composite materials. Experience in oxyacetylene and arc welding, sheet metals, bench metals, heat-treatment, and foundrywork.

TED 161 Imaging Technology. *4(2-4-0) . F,S.* Basic principles of imaging for mass reproduction including relief, gravure, offset lithography, screen, and electronic printing. Projects in prepress design and plate making techniques including digital and conventional photography and understanding of how visual art and technology principles are combined to communicate effectively. Students will be responsible for transportation to field trips.

TED 207 Introduction to Teaching Technology Education. *3(2-0-0) . S.* Introduction to teaching technology education programs in middle and secondary schools. Field experiences and course assignments including three hours each week assisting classroom teachers in the public schools. Students are responsible for their own transportation to the field experience sites.

TED 221 Construction Technology. *3(1-4-0) . S. Preq: TED 110. Coreq: TED 330, TED 371, TED 384.* Overview of structures and their construction. Drawings and models completed in a laboratory environment to simulate construction methods.

TED 246 Graphic Arts Technology. *4(2-4-0) .* Basic principles associated with using electronic publishing, offset lithography, screen printing, and photography for visual communication. Basic understanding of how visual art and technology principles are combined to communicate effectively using photographic and print media.

TED 261 Communication Technology. *3(2-2-0) . S. Preq: TED 161 or GC 410. Coreq: TED 371.* Technological means of communication and their historical, present, and potential impacts on society, culture, economy, politics, ethics, and the environment. Lab experiments, audio and video production, and development of learning activities for middle school and secondary school students.

TED 276 Transportation Technology: Energy, Power and Infrastructures. *3(1-4-0) . F. Preq: TED 110. Coreq: TED 330, TED 384.* Theoretical and practical aspects of transportation. Topics include energy conversion, application of power, infrastructures for transmission and control of energy, transportation systems and industries, and conservation of energy. Activities include laboratory testing, experiments, development of activities for

teaching secondary students about transportation technology, and use and care of equipment.

TED 330 Manufacturing Technology. *3(1-4-0) . F. Preq: TED 221 or TED 276. Coreq: TED 481.* Manufacturing organization, product design, and production system design. Students design, oprate and evaluate a small-scale manufacturing system.

TED 351 Ceramics: The Art and Craft of Clay. *3(2-2-0) .* Contemporary and historical examples of the art and craft of ceramics will be studied. Experiences in designing ceramic forms and expressing individual ideas through the medium of clay.

TED 359 Electronics Technology. *3(2-2-0) . Preq: Junior standing.* Direct current, alternating current, and semiconductors. Measurement and circuit behavior. Experimentation with application circuits.

TED 371 Emerging Issues in Technology. *3(2-2-0) . F. Preq: TED 261, TED 221, and GC 120.* Examination of current and projected technology topics which are growing in importance but are not presently reflected in the Technology Education programs of NC public schools. Laboratory experiences include development, revision, and field testingof appropriate learning activities for middle and high school students in the selected topic areas.

TED 384 Computer Applications in Industry. *3(1-4-0) . S. Preq: TED 221 or TED 276. Coreq: TED 481.* Computerized control systems used in industry including computers and controllers, automated machines, and robots. Students design and operate automated systems.

TED 407 Field Work in Technology Education. *2-6. F,S,Sum. Preq: Junior standing and Consent of Instructor.* Supervised off-campus field experience in Technology Education that relates on-the-job experiences in the field to the technical competencies which are the content of the curriculum. May be repeated for a maximum of 6 credits.

TED 452 Lab Planning in Technology Education. *3(1-0-4) . S. Preq: Senior standing. Coreq: TED 457 or TED 407.* Laboratory planning, management, and safety for technology education. Physical layout, selection, specification, and cost of equipment; the safe operation, repair and maintenance of power and hand tools; specification of expendable supplies, estimating, and ordering.

TED 456 Curriculum and Methods in Technology Education. *3(2-2-0) . F. Preq: Technology Education Majors, Admittance to teacher education candidacy.* Methods of teaching Technology Education. Emphasis on curriculum development, instructional methods, laboratory instruction, meeting needs of special populations, and management of student organizations.

TED 457 Student Teaching in Technology Education. *3-8. S. Preq: Admission to Professional semester. Coreq: TED 452 or TED 495.* Skills and techniques involved in teaching technology education through practice in a public school setting.

TED 461 Communication Technology. *3(2-2-0) . Preq: GC 350, TED 246 and 359.* Technological means of communication and their present and potential historical impacts on society, culture, economy, politics, ethics and the environment. Lab experiments, radio and television production, and development of learning activities formidble school and secondary school students.

TED 481 Research & Development in Technology Education. *3(1-4-0) . F. Preq: TED 330 or TED 384.* Senior design, research, and development experience in technology education. Students research a problem, ideate potential solutions, select a final solution, construct a prototype, and complete a final report analyzing the chosen solution.

TED 490 Special Problems in Technology Education. *1-6. F,S. Preq: Junior standing and Consent of Instructor.* Supervised, independent investigation in a defined area of interest in Technology Education.

TED 495 Senior Seminar in Technology Education. *3(3-0-0) . S. Preq: Junior standing and Consent of Instructor.* An in-depth investigation of a topic or a set of problems and/or issues in Technology Education.

TED 498 Independent Study in Technology Education. *1-3. F,S,Sum. Preq: Junior standing and Consent of Instructor.* Individual or group study of special topics in professional technology education. The topic and mode of study are determined by the faculty member after discussion with the student. May be repeated for a maximumof 6 credits.

TEXTILE MATERIALS SCIENCE

TMS 210 Yarn and Fabric Formation and Properties. *4(3-2-0) . F. Preq: TC 105. Coreq: PY 205, or 211.* The basic concepts of yarn formation, weaving, knitting, and nonwoven fabric formation. Emphasis on structure property relationship. Impact on product performance.

TMS 211 Introduction to Fiber Science. *3(2-2-0) . F,S,Sum. Preq: TT 105, PCC 105. Coreq: MA 131 or 141.* Properties of fibers related to type and chemical structure. Fiber classification and identification. Reaction to moisture, stress-strain properties, and methods of measuring physical properties. Relationship between polymer structure, fiber properties and utilization.

TMS 460 Physical & Mechanical Properties of Textile Materials. *3(3-0-0) . F. Preq: MA 230 or MA 241, PY 211, TMS 211.* Structural and physical properties of fibers, yarns and fabrics, including mechanical, thermal, optical, frictional, electrical and moisture properties. Relationships between structure, properties and performance.

TMS 471 Textile Materials Design I. *3(1-4-0) . F.* Functional textile materials design, modeling techniques and fault analysis methodologies. Product development from initial design phase, testing, analysis, to prototype production. Project will be completed in TMS 472.

TMS 472 Textile Materials Design II. *3(1-4-0) . S. Preq: TMS 471.* Advanced elements of textile materials design and development. Process-structure-property relationships of manufacturing processes. Risk and reliability. Design, testing, analysis, and prototype production. Completion of project started in TMS 471.

TMS 492 Special Topics in Textile Materials Science. *1-3. F,S. Preq: Consent of Instructor.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

TOXICOLOGY

TOX 201 Poisons, People and the Environment. *3(3-0-0) . S.* Introduction to the fascinating world of chemical poisons including their many and varied effects on people as well as the environment. Learn how and why poisons have played an important role in history, how to critically evaluate the chemical riskinformation reported in the media, and the underlying principles of $the basic science of poisons.$

TOX 401 Principles of Toxicology. *4(4-0-1) . F. Preq: CH 220 or CH 221; BIO 181 or ZO 160.* Introduce students to the basic principles of toxicology. Will cover the history and scope of the field; absorption, distribution, metabolism and elimination fo toxicants; types and mechanisms of toxic action; carcinogenesis; environmental toxicology as well as human and ecological risk assessment.

TOX 415 Environmental Toxicology and Chemistry. *4(4-0-1) . S. Preq: CH 220 or CH 221; BIO 181 or ZO 160 recommended.* Provides students with an appreciation and understanding of the principles of environmental toxicology and chemistry including the sources, fate, and effects of chemicals in the environment; emphasis on contemporary problems in human health and the environment.

TOX 490 Seminar in Environmental Toxicology. *1(1-0-0) . S. Preq: TOX 401.* Presentation of research findings by invited scientist; presentation of literature research by students; guidelines for presenting oral and poster presentations at scientific meetings.

TOX 495 Special Topics in Toxicology. *1-3. F,S,Sum.* Offered as needed to present materials unavailable in regular course offerings or for offering new courses on a trial basis.

TOX 499 Undergraduate Research in Toxicology. *1-3. F,S,Sum. Preq: Sophomore standing or higher.* Research for students in Toxicology. In lieu of a syllabus, student and professor will prepare a contract which details the research and how the results will be disseminated.

TEXTILE TECHNOLOGY

TT 105 Introduction to Textile Technology. *3(3-0-0) . F, S.* Introduction to Textile and Apparel, Technology and Management. Structures and production methods for fabrics, yarn, and fibers. Introduction to the nature of polymers and the characteristics of polymers which make them useful for producing fibershat are practically and aesthetically desirable. Design of end products as well as fundamental economic and supply chain issues.

TT 203 Materials, Polymers and Fibers Used in Nonwovens. *3(3-0-0) . F. Preq: MA 141, PY 205.* Fundamentals of raw material used in nonwoven processes. Raw material production, chemical and physical properties of nonwoven raw materials and assessment of material properties. Introduction of structure/property relationships for these materials and how these relationships influence end use applications. Credit will not be given for both TT 203 and TMS 211

TT 221 Yarn Production and Properties I. *2(2-0-0) . F,S,Sum. Preq: TT 105. Coreq: MA 131 or MA 141; PY 211 or PY 205.* The techniques available for manufacturing yarns from staple fibers. A review of yarn numbering and fiber properties. The principles involved in opening, cleaning, blending, drafting, twisting and winding. Short and long staple spinning systems including a review of opening and cleaning lines, carding, draw frames, roving frames and different spinning machines. Filament yarn processing.

TT 252 Formation and Structure of Textile Fabrics. *4(3-2-0) . F,S. Preq: TT 221.* Fundamentals of the conversion of fibers and yarns into woven, knitted, and nonwoven fabrics, and fabrics' conversion systems. Introduction to woven, knitted and nonwoven fabric design structure. Structure, property, and performance relations of textile fabrics. Testing and evaluation of textile structures.

TT 305 Introduction to Nonwoven Products and Processes. *3(3-0-0) . F,S. Preq: TT 203 or (PCC 203 and TMS 211), (MA 231 or MA 241), and (PY 211 or PY 208), . Coreq: TT 252 and ST 361.* Fiber web/nonwoven fabrics produced directly from fibers or their precursors. Physical and chemical nature of local bonding and fiber entanglement. Viable processes for producing these fabrics. Economic justification for process and production. Product/process interaction. Plant visits whenever possible.

TT 321 Yarn Production and Properties II. *3(2-2-0) . F, S. Preq: TT 221.* Fiber and machine interactions in blending, carding, drawing and spinning. Drafting theories and the influence of fiber and machine variables on irregularity. The role of twist on yarn structure, properties and productivity. Developments and limitations in processing technology.

TT 331 Performance Evaluation of Textile Materials. *4(3-2-0) . F, S. Preq: ST 311 or ST 361, TMS 211, TT 221, TT 252 or TT 251, PY 211 or PY 205, and MA 231 or MA 241.* Standards, principles and effects of test conditions in measuring basic physical and mechanical properties of textile materials. Design of test and interpretation of test results in relation to end-use performance, product development, process control, research and development and other requirements.

TT 341 Knitted Fabric Technology. *3(2-2-0) . S. Preq: TT 252 or TT 241.* Review of knitted fabric production techniques. Technology of more advanced weft and warp knitting. Jersey and rib fabric modification techniques, yarn knitability and productivity, yarns, creels, patterning and machinery developments, manufactureand properties of warp knit fabrics such as mesh, laid-in, weft insertion and plush. Quality measures, measurement and standards, defects and problem solving. Management of knitting operations.

TT 351 Woven Fabric Technology. *3(2-2-0) . F, S. Preq: TT 252 or TT 251.* Technology of producing woven fabrics including yarn preparation for weaving. Process control and automation in weaving. Fabric development, design and management of weaving operations.

TT 370 Technical Fabric Design. *4(3-2-0) . S. Preq: Two courses out of TT 341, 351 and 305.* Properties of woven, knitted and nonwoven fabrics. Computer techniques and other methods of reproducing structural designs and means of designing fabrics to specifications. Laboratory consists of projects involving design analysis and testing.

TT 371 Woven Textile Design. *3(1-4-0) . S. Preq: TT 252.* Design and production of woven fabrics. Exploration of various basic structures, color and textural effects. Development of design abilities through hand-production methods, including an introduction to Computer-integrated Design systems and an awareness of industrial processes.

TT 372 Knitted Textile Design. *3(1-4-0) . F. Preq: TT 252.* Design and production of hand- and machine-knitted fabrics. Exploration of basic structures, color and textural effects. Development of design abilities through hand- and machine-production methods, including an introduction to Computer-integratedDesign Systems and an awareness of industrial processes.

TT 405 Advanced Nonwovens Processing. *3(3-0-0) . S. Preq: MA 241, PY 208, TT 305.* Mechanisms used in the production of nonwoven materials. Design and operation of these mechanisms. Process flow, optimization of process parameters, influence of process parameters on product properties.

TT 406 Bonding Fundamentals in Nonwovens. *3(3-0-0) . F. Preq: TT 405, MAE 308, MAE 310.* Fundamentals of fluid mechanics and heat transfer mechanisms during the bonding of nonwovens. In-depth description of hydroentangling, thermal bonding and needle punching techniques. Modeling methods and laboratory work are assigned.

TT 407 Characterization Methods in Nonwovens. *3(2-2-0) . F. Preq: ST 361, TT 405.* Fundamentals of methods used in evaluating properties and performance of nonwovens. Assessment of thermal, mechanical, moisture transport and barrier properties of nonwovens. Reliability and interpretation of test results.

TT 408 Nonwoven Product Development. *3(2-2-0) . S. Preq: TT 407.* Fundamentals of nonwoven product development. In-depth knowledge of the materials, processes and nonwovens products. Design of a set of experiments intended for product development. Students work in teams to design, fabricate and evaluate nonwoven products.

TT 421 Developments in Yarn Manufacturing. *3(3-0-0) . S. Preq: TT 321.* A critical appraisal of developments in yarn manufacturing, with emphasis on their influence on process and product quality and range.

TT 425 Textured Yarn Production and Properties. *3(2-2-0) . F. Preq: TT 331.* Structure and properties of continuous filament yarns. Examine response to elevated temperature and variables for texturing methods of producing bulked, textured and torqued yarns. Testing of yarn behaviors and discussion of problems encountered during processing.

TT (TAM) 431 Quality Management and Control In Textile Manufacturing. *3(3-0-0) . F,S. Preq: TT 221, TT 252, TT 331, and ST 361 or BUS 350.* Principles of quality and process management and control in textile/apparel manufacturing with emphases in quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.

TT 441 Advanced Knitting Systems and Fabrics. *3(2-2-0) . F. Preq: TT 341.* Loop forming concepts and mechanisms of complex warp and weft-knitted fabrics. Structural design and limitations, potential applications and knitability. Analysis of mechanical systems and tensioning forces on fabric formation. The effect on dimensional and mechanical properties.

TT 451 Advanced Woven Fabric Design. *3(2-2-0) . S. Preq: TT 252 and TT 331.* Design and production requirements for highly specialized woven fabric structures. The laboratory activities will include a project on design from concept to final production and finishing.

TT 470 Jacquard Woven Fabric Design. *3(1-4-0) . F. Preq: TT 252, TT 371.* This course is dedicated to the study of Jacquard woven fabric design and structural technology through the use of CAD as both an aesthetic and technical tool, and will culminate in each student producing a unique fabric collection based upon his/her developed area of interest. Jacquard design for many different end uses is addressed, from art fabrics to unique specialty products. A field trip in this course will require personal transportation.

TT (TAM) 499 Textile Senior Project. *4(2-4-0) . F,S. Preq: Senior standing.* This is a project based course to be taken in the last semester of the Senior year. In this capstone course the students work in cross-functional teams to research and solve applied problems in textile related fields. The results of the projects will be presented formally at the end of the semester. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses

UNIVERSITY STUDIES COURSES

USC 101 Introduction to University Education I. *1(1-1-0) . F.* Developmental and academic topics to assist students in making rational decisions about majors: including issues between high school and college, learning styles, career decision making, assessing motivation and values, overview of university majorsand diversity.

USC 102 Introduction to University Education II. *1(1-0-0) . S. Preq: USC 101.* Continuation of USC 101

USC 201 Introduction to the World of Labor. *3(4.50-0-0) . SUM1, SUM2. Coreq: USC 201L.* Examines the modern workplace, as well as its evolution over the past century. Students will study several issues relating to work, focusing on the power of work, expectations of the employer, as well as culture and conflicts in the workplace. Students will have the opportunity to integrate their learning with practical work experience. Students are responsible for their own transportation to and from their workplace. This is a 5-week course. Must hold sophomore standing; course designed for students with minimal work experience.

USC 401 Transitions for the College Graduate. *2(2-0-0) . F,S.* Focus on the unique transitions the student will face upon leaving college. Through a variety of formats, students will have the opportunity to explore four main aspects of their post-baccalaureate lives: career, budgeting, coping with extracurricular retirement/identity, and civic and educational opportunities.

VETERINARY SCIENCE

VMP 401 Poultry Diseases. *4(3-3-0) . S.* Concepts of factors contributing to or causing disease, disease cycle, host responses, and general approaches to prevention and control including management and biosecurity methods, immunization, and medication. Recognition, diagnosis, prevention, control, and treatment of economically significant infectious and noninfectious diseases affecting poultry.

VMP 420 Disease of Farm Animals. *3(3-0-0) . S. Preq: Junior standing.* Pathology of bacterial, viral, parasitic, nutritional, thermal and mechanical disease processes for farm animals. This emphasis practices for prevention and control of each disease.

WOMEN'S AND GENDER STUDIES

WGS 200 Introduction to Women's and Gender Studies. *3(3-0-0) . F.* Introduction to women's and gender studies as an interdisciplinary field spanning the humanities, social sciences and natural sciences. Study of historical perspectives and contemporary understanding of women and gender. Theory, systematic analysis and experimental accounts used to explore complexities of gender, and other identity determinants, mechanisms of power and privilege, and avenues for social change.

WGS (SOC) 204 Sociology of Family. *3(3-0-0) . F,S,Sun.* Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

WGS (STS) 210 Women and Gender in Science and Technology. *3(3-0-0) . F.* Interdisciplinary introduction to the reciprocal relationships between scientific/technological research and contemporary understanding of gender. Special emphasis on social factors influencing scientists and engineers in their professions.

WGS (SOC) 304 Women and Men in Society. *3(3-0-0) . F,S. Preq: 3 cr. in SOC, 200 level.* A sociological analysis of women and men in contemporary American society. Perpetuation of and change in gender stratification using sociological concepts, theories and research. How gender expectations developed and transmitted. Historical data and research on diversity in American society used for analysis of causes and consequences of gender inequality.

WGS (ENG) 305 Women and Literature. *3(3-0-0) . S. Preq: Sophomore standing.* Nineteenth- and twentieth-century womens' literature, as shaped by the intersecting and competing claims of gender, race, sexuality, and culture. Focus on fiction, accompanied by critical readings from American studies, feminist literary criticism,and postmodern theory.

WGS (PS) 306 Gender and Politics in the United States. *3(3-0-0) . S. Preq: PS 201.* This course explores the role of gender in contemporary American politics. The course examines the historical course of gender politics to see how we have arrived at the present state. It investigates the activities that women and men play in modern politics-voting, running for office, serving in office, etc., and how women and men perform these activities in different ways. The course also focuses on major areas of public policy that affect women and men in different ways.

WGS 310 Women's and Gender Studies Internship. *3(3-0-0) . F, S.* Internship program. Introduction to careers that deal specifically with women's issues. Ten-hours-per-week work at a nonprofit or governmental organization. Contextualization of that experience through additional academic requirements.

WGS (ENG) 327 Language and Gender. *3(3-0-0) . S. Preq: ENG 111, ENG 112.* Introduction to the use of language by men and women. Research in Linguistics and Women's Studies addressing issues such as the acquisition of gender-differentiated language, gender and conversational interaction, sexism in language, gender issues in society, and the relationship between language, gender, and other social constructs (e.g., class, culture, and ethnicity).

WGS (MUS) 360 Women In Music. *3(3-0-0) . S.* The role of women in music as patrons, teachers, composers, and performers, placing them within the social, economic, and political framework to which they belong. Emphasis on Western Art Music and the role of women in popular music. No previous formal training in music is required.

WGS (COM) 362 Communication and Gender. *3(3-0-0) . F,S. Preq: Junior standing, COM 112.* Effects of gender on the interpersonal communication process. Construction of gendered identities via communication practices. Examination of theories of gender and the role of gender in organizational, institutional, and media communication practices.

WGS (PSY) 406 Psychology of Gender. *3(3-0-0) . F, S. Preq: PSY 200, 201 or HSS 200.* Current theory and research on perceived and actual biological, social, cognitive, personality and emotional similarities and differences of men and women throughout the lifespan. The construction and consequences of gender in our society and others.Credit cannot be given for both PSY 406 and PSY 506

WGS (SOC) 407 Sociology of Sexualities. *3(3-0-0) . S. Preq: 3 hours SOC 200 level, 300 level, or equivalent research methods course.* Exploration of sexuality in a social context. Relationship between sexuality, gender and power in the U.S. Historical trends in behaviors and identities: social movements and sexual issues; current behavioral trends. Some issues covered; identity, social construction, sexual meanings.

WGS (ENG) 410 Studies in Gender and Genre. *3(3-0-0) . F. Preq: Sophomore standing.* This course examines the ways in which writers have revised the literary genres to include gendered experience. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

WGS (PS) 418 Gender Law and Policies. *3(3-0-0) . F. Preq: Nine hours of Political Science.* Law and policy pertaining to contemporary gender issues. Examination of agenda setting, policy formation, implementation, judicial interpretation and evaluation of selected issues, such as reproductive policies, equal employment and sexual abuse.

WGS (ANT) 444 Cross-Cultural Perspectives on Women. *3(3-0-0) . S, Alt. yrs.. Preq: 3 hours cultural anthropology.* Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women's statuses and roles. Effect of gender on social position

WGS (HI) 447 History of American Women to 1900. *3(3-0-0) . Alt yrs.* The historical experience of women in America from the colonial period to 1890. Women's work, education, legal and political status, religious experience, and sex roles: age, class, race, sexual preference, and region as significant variables in women's experience.

WGS (HI) 448 American Women in the Twentieth Century. *3(3-0-0) .* Women's historical experience in America, 1890-1990. Changes in women's work, education, legal and political status, and sex roles, age, class, race, sexual

preference and region as significant variables in women's experience.Credit will not be given for both HI 448 and HI 548.

WGS (REL) 472 Women and Religion. *3(3-0-0) . F (Alt. yrs., odd). Preq: one course in religious studies or women's and gender studies.* Historical, literary, and theological sources dealing with portrayals of women and women's religious experience in several religious traditions of the world through different historical periods, from ancient to modern. Impact of feminist theory on the academic study of religion; methodological issues surrounding the study of women's religious history; role of religion in shaping attitudes toward women and their status in society.

WGS 492 Theoretical Issues in Women's and Gender Studies. *3(3-0-0) . S. Preq: WGS 200.* Examination of feminist theory. Study of formative texts in modern feminism, drawn from various disciplines within the humanities, social sciences, and natural sciences. In-depth exploration of feminist perspectives on issues of race. class, gender, sexuality, work and mothering, among others. Analysis of local and global cultural practices using feminist theoretical frameworks.

WGS 493 Special Topics in Women's and Gender Studies. *3(3-0-0) . F.* Examination of varying topics on women and/or gender from a multidisciplinary perspective.

WOOD AND PAPER SCIENCE

WPS 100 Introduction to Pulping & Papermaking. *1(0-3-0) . F.* Introduction to the paper industry and the Pulp & Paper Science Curriculum. Overview of pulping and papermaking processes including plant tours and laboratory exercises. Two Saturday field trips to paper mills required. Concepts of professional development including resumes, interviewing, and summer job placement procedures.

WPS 104 Introduction to Wood Products. *2(2-0-0) . F.* Introduction to College of Natural Resources and University services, including libraries, computer labs, Leadership Development Series. Awareness of size and diversity of wood industry, career potential. Setting career goals, educational and professional development goals.

WPS 201 Pulping and Papermaking Technology. *3(3-0-0) . S.* Survey of the pulping and papermaking processes. Covers characteristics of wood and different types of fiber, key equipment and process variables for pulping, bleaching and chemical recovery processes, with emphasis on the kraft process. Papermaking variables and equipment, particularly on a Fourdrinier machine, secondary fiber processing, and aspects of printing and coverting discussed.

WPS (FOR) 202 Wood Anatomy and Properties. *3(2-3-0) . F.* Formation, anatomy and properties of wood. Structural features of softwoods and hardwoods and the relationships among anatomy, physiology, physical and mechanical properties. Variability, naturally occurring defects, and wood deterioration are discussed and related to wood utilization. Techniques on hand lens and microscopic identification of wood.

WPS 203 Wood Physical Properties. *4(3-2-0) . S.* Physical properties of wood, including specific gravity, dimensional behavior, stress and set, psychrometry, thermal, electrical and moisture relations.

WPS 205 Wood Products Practicum. *5(5-0-0) . Sum. Preq: WPS 202 or 203.* Preparation of drawings and bill of materials for a furniture item. Parts are machined, assembled, and finished. Lumber grading, drying, and gluing principles. Four to five days are spent visiting industries to provide an appreciation for products and processes. The student is responsible for room and board; transportation is provided.

WPS 210 Wood Products Internship. *1(1-0-0) . F,S,Sum. Preq: Completion of summer practicum.* Experience in the forest products or related industries with a departmentally selected employer.

WPS 211 Pulp and Paper Internship. *1(1-0-0) . Preq: Completion of soph. year.* Experience in the pulp and paper industry. Problem solving in an industrial setting to gain insight of pulp and paper technology. Written report required.

WPS 212 Paper Properties. *3(2-1.50-0.50) . F. Preq: WPS 201.* Measurement and characterization of the structural, mechanical, and optical properties of paper and board. Effect of raw materials and manufacturing processes on structure and properties. Case studies on troubleshooting product quality variations.

WPS 240 Wood Products. *3(3-0-0) . F.* Introduction to forest products industries, including the economic importance, current manufacturing technology, raw material requirements and the future of the industries.

WPS 242 Wood Fiber Analysis. *2(2-0-0) . F,S.* The macro and micro structure of wood and the relationships of anatomical structures to the physical properties of wood and paper.

WPS 301 Wood Processing I. *4(3-2-0) . F. Preq: WPS 202 or WPS 203; WPS 205.* The processes of drying, gluing and finishing wood. Insect, fungal, and thermal degradation of wood. Drying procedures, glued wood products, furniture and panel finishing and treatments to prevent biological and thermal degradation. Current industrial equipment and processes.

WPS 302 Wood Processing II. *4(3-2-0) . S. Preq: WPS 202 or WPS 203; WPS 205.* Theories and techniques of processing raw wood into useable products. Principles of operation of current industrial wood milling equipment including primary and secondary processing. Machining of reconstituted wood products.

WPS 309 Wood Products Processing: Facilities and Infrastructure. *3(3-0-0) . S. Preq: WPS 205.* Wood Products production methods - simulation, optimization, plant layout. Plant infrastructure - hydraulics, compressed air, electrical, dust extraction.

WPS 322 Wet End and Polymer Chemistry. *4(3-3-0) . F. Preq: WPS 212, CH 221.* Prepares students to solve problems related to chemical usage on paper machines. Subjects include water chemistry, paper machine operations, fibers, fillers, alum, sizing agents, polyelectrolytes, colloidal interactions, strength agents, dyes, strategies to optimize retention, dewatering strategies, strategies to achieve more uniform paper, strategies to improve production rates, recycling aqueous coatings, and wet-end chemical process control.

WPS 332 Wood and Pulping Chemistry. *3(3-0-0) . Preq: CH 221, 223; PY 205, PY 208; CH 331 or CH 431 or CHE 315.* Introduction to carbohydrate chemistry focusing on the structure and reactivity of wood polysaccharides, hemicelluloses and cellulose and on the chemical structure of lignins and wood extractives. Special emphasis on the chemical reaction of wood components occurring in pulping and bleaching processes.

WPS 344 Introduction to Quality Control in Wood Products. *3(3-0-0) . S. Preq: ST 361.* Statistical quality control techniques applicable to the manufacture of wood products. Control chart techniques for monitoring defects, defectives and measurements. Acceptance sampling procedures. Examples from the wood products industries will be used.

WPS 350 Wood Products Literature. *2(2-0-0) . S. Preq: Completion of WPS 205.* Exploration of the wood products literature; use of library services, oral and written reports, with emphasis on independent study.

WPS 355 Pulp and Paper Unit Processes I. *3(3-0-0) . S. Preq: CHE 205 with a C or better;Not open to PPT-Chemical Engineering Concentration students.* Selected topics in chemical engineering as applied in the pulp and paper industry. Emphasis on computational practice.

WPS 360 Pulp and Paper Unit Processes II. *3(3-0-1) . S. Preq: WPS 201, WPS 355 or CHE 311.* Application of chemical engineering principles to the analysis of pulp and paper unit processes. Emphasis on practical problems in fluid dynamics, heat transfer, mass transfer and thermodynamics. Problem solution techniques include hand calculationand computer simulation tools.

WPS 371 Pulping Process Analysis. *3(1-3-0) . S. Preq: WPS 201.* Preparation and evaluation of different types of wood pulp. A new wood raw material is selected each year with the purpose of studying and critically evaluating the principal pulping and bleaching variables.

WPS 415 Senior Research Projects. *3(1-6-0) . F. Preq: WPS 371 and Departmental approval required.* Multi-task problem-solving. Under faculty guidance, student groups will select project, develop experimental design, carry out experiment and analyze results. Major writing and oral presentations required.

WPS 416 Process Design and Analysis. *3(2-2-0) . S. Preq: WPS 417.* Design, management and analysis of technical projects. Emphasis on concepts and techniques used in economic analysis of projects. Use of computer simulation for process design and cost analyses. Team projects to analyze cost

and operating feasibility of proposed major mill modification. Written and oral presentations required throughout the semester.

WPS 417 Process Design and Analysis Lab. *2(1-2-0) . F. Preq: WPS 360.* Application of modeling and simulation techniques for the analysis of pulp and paper processes. Computer simulation models used to study process variable interactions and process modifications. Oral presentations of case studies and team project assignments required.

WPS (FOR) 423 Forest Machinery and Systems. *3(2-3-0) . F. Preq: Junior standing in FOR, WP or BAE.* Applications of engineering principles to problems in forest operations: power sources; testing; rating and capabilities of forest machinery; power requirements and utilization efficiencies; effects of vehicle design parameters on stability, safety, and operation under load; traction devices and vehicle mechanics.

WPS 441 Wood Mechanics. *4(3-3-0) . F. Preq: MA 231, PY 212, WPS 203.* Introduction to orthotropic elasticity. Shear effect on beam deflections. Wood- based composite beams. Shear and bending stress distribution in composite beams. Elastic stability. Influence of density, moisture content, load direction, temperature and load duration on mechanical properties of wood. Creep and mechanosorptive creep. Grading for structural applications. Allowable stresses . Structural fasteners.

WPS 444 Wood Composites. *3(3-0-0) . S. Preq: Senior standing in Wood Products.* Manufacture, properties, and processing of wood-based composites. Commodity products - plywood, particleboard, waferboard, and oriented strandboard - as well as specialty composite products.

WPS 450 Wood Industry Case Studies. *2(1-0-3) . S. Preq: Senior standing in WP.* Presentation of relevant Wood industry problems involving material selection, processing and managerial techniques. Causes of in-use failures of wood products and means of prevention.

WPS 465 Paper Physics and Product Design. *3(3-0-0) . S. Preq: Senior standing in PPT.* Study of fundamental knowledge on the structure and properties of fibers and fibrous products, and the related physical and physiochemical mechanisms. Product design exercises will apply the fundamental understanding to specific end use requirements.

WPS 472 Paper Process Analysis. *3(2-2-2) . S. Preq: WPS 216, 310, 371.* Product analysis, materials selection, process planning, manufacture of various types of paper using pilot plant equipment, finished product testing and comparison with standard products. Machine unit operations, materials flow balances, energy balances performed on operations. Team assignments with written and oral presentation of results.

WPS 475 Process Control in Pulp and Paper. *3(2-3-1) . F. Preq: Senior standing in PPT. Coreq: WPS 410.* Overview of the various aspects of control including process modeling, design of control loops and stability analysis in pulp and paper. Emphasis on distributed digital control (DDC), including hands-on programming and control loop development on aDDC computer.

WPS 482 Projects in Wood Products. *2(0-2-0) . F,S,Sum. Preq: Senior standing in WP.* Individual library or laboratory research projects selected and conducted with the approval and guidance of faculty.

WPS 491 Special Topics in Wood and Paper Science. *1-4. F,S,Sum.* Independent study of management or technology problems selected with faculty approval or the offering of experimental courses.

ZOOLOGY

ZO 150 Animal Diversity. *4(3-3-0) .* Classification of animals, macroevolution, systematics, and phylogeny, including relationship to other kingdoms. Patterns of diversifications in body design and relationship between body design and environment, with emphasis on invertebrate animals. Study selected animal assemblages.

ZO (BIO) 160 Introduction to Cellular and Developmental Zoology. *4(3-3-0) . S,Sum.* Basic concepts and principles of cellular and developmental zoology with emphasis on the physical basis of life, the cell as the fundamental unit of life and the mechanisms involved in the development of multicellular animals.

ZO 212 Basic Human Anatomy and Physiology. *4(3-3-0) . F,Sum. Preq: BIO 125 or BIO 183 or ZO 150 or ZO 160.* Major emphasis on structure and function of the muscular, skeletal, circulatory and nervous systems of humans.

ZO (MEA) 220 Marine Biology. *3(3-0-0) . Preq: MEA 200 or BIO 125.* Introduction to marine plants and animals, their adaptations to life in the sea and ecological interactions in selected marine environments (e.g. coral reefs, deep sea, salt marshes). Interactions of man with the sea: food from the seas, biology of diving. Optional trip.

ZO (FOR, FW) 221 Conservation of Natural Resources. *3(3-0-0) . F,S,Sum.* Importance of natural resources and their role in human environment. Physical, biological and ecological principles underlying sustainability of natural resources with attention to consequences of human impacts while meeting society needs.

ZO 250 Animal Anatomy and Physiology. *4(3-3-0) . Preq: ZO 150 and (ZO 160 or BIO 125 or BIO 183).* Roles of physical laws, environmental challenges, and evolutionary history in shaping animal structure and function. Selected examples from invertebrates and vertebrates. Laboratory in anatomy and physiology, hypothesis generation and testing and data analysis and presentation.

ZO 260 Evolution, Behavior, and Ecology. *4(3-3-0) . S. Preq: ZO 150 or BIO 183.* Principles of evolution, animal behavior, and ecology. Mechanisms of microevolution and speciation, modes, and variation in animal behavior, and population, community, and ecosystem level processes. Methodology and logic of evolution, behavior andecology and applications to conservation and management issues.

ZO 295 Special Topics in Zoology. *1-4. Preq: BIO 125 or BIO 183 or ZO 150 or ZO 160.* Experimental offerings in Zoology.

ZO 315 General Parasitology. *3(2-3-0) . S. Preq: ZO 150 or ZO 160 or BIO 125 or BIO 183.* General principles of parasitic symbiosis. Emphasis on life cycles, epidemiology, and pathology of major parasites of humans and domestic animals.

ZO (FW) 353 Wildlife Management. *3(3-0-0) . F. Preq: ZO 150.* Historical development of Wildlife Management from anecdotal, observational practices to modern, scientific approaches used around the world. Principles of population analysis, management, protection and conservation of animals, particularly those of conservation, aesthetic, sport or food values in urban, rural and wilderness areas. Ethics of hunting and trapping. Contradictory objectives challenging modern wildlife managers.

ZO 361 Principles of Embryonic Development. *3(3-0-0) . S. Preq: ZO 150 or ZO 160 or BIO 125 or BIO 183.* An integrated study of descriptive and experimental embryology. Development of both invertebrates and vertebrates at levels of organization from molecular to organismal.

ZO 370 Developmental Anatomy and Histology of the Vertebrates I. *3(3-0-0) . F. Preq: ZO 150 or ZO 160 or BIO 125 or BIO 183. Coreq: ZO 375.* An integrated study on the embryonic development, gross anatomy, microanatomy and phylogeny of vertebrate organ systems; surface and connective tissues, the skeleton and the muscular system.

ZO 371 Developmental Anatomy and Histology of the Vertebrates II. *3(3-0-0) . S. Preq: ZO 370. Coreq: ZO 376.* An integrated study on the embryonic development, gross anatomy, microanatomy, and phylogeny of vertebrate organ systems; the circulatory, respiratory, digestive, urogenital, endocrine, and nervous systems.Credit is not allowed for both ZO 371 and ZO 405.

ZO 375 Developmental Anatomy and Histology Laboratory I. *2(0-6-0) . F. Preq: ZO 150 or ZO 160 or BIO 125 or BIO 183. Coreq: ZO 370.* Vertebrate organ systems utilizing dissections of preserved specimens and microscopic examination of embryos and tissue preparations; early embryonic development, surface and connective tissues, the skeleton and muscular system.

ZO 376 Developmental Anatomy and Histology Laboratory II. *2(0-6-0) . S. Preq: ZO 370 and ZO 375. Coreq: ZO 371.* Vertebrate organ systems utilizing dissections of preserved specimens and microscopic examination of embryos and tissue preparations; late embryonic development and the circulatory, respiratory, digestive, urogenital, endocrine, and nervous systems.

ZO 402 Invertebrate Zoology. *2(2-0-0) . S, even yrs. Preq: ZO 150.* Survey of invertebrate phyla, excluding the Protista, emphasizing their functional biology.

ZO 403 Invertebrate Zoology Laboratory. *2(0-6-0) . S,Alt. yrs.(even). Preq: ZO 150.* Examination of living and preserved invertebrates to study their distinguishing characteristics and to observe anatomical modifications for function.

ZO 405 Functional Histology. *3(3-0-0) . Sum. Preq: BIO 183 or ZO 150 and ZO 160. Junior standing or Senior standing.* Offered only as a distance education course via the internet. Functional Histology describes the cellular structure of tissues and organs. Human organs are emphasized, with brief consideration given to variation in other mammals. Tissue and organstructure is related to function, including examples of malfunction (histopathology). The course is especially appropriate for students planning a career in veterinary science, medicine, or allied health fields. Credit not allowed for both ZO 371 and ZO 405. Offered by distance education only.

ZO 410 Introduction to Animal Behavior. *3(3-0-0) . F. Preq: ZO 150 or ZO 260.* Studies of animal behavior in vertebrates and invertebrates including physiological mechanisms and adaptive significance.

ZO 412 Human Anatomy. *4(3-3-0) . S. Preq: BIO 183 or ZO 250, and Junior standing or Senior standing.* Study of the structure of the human body, utilizing a systems approach. Focus on gross anatomy, with reference to microanatomy and embryonic development as needed to understand gross morphology. Emphasis on the interrelationship of structure and function. Laboratory study facilitated through use of human skeletons, anatomical models, and electronic media as well as dissection of mammalian systems and selected organs.

ZO (BO) 414 Cell Biology. *3(3-0-0) . S. Preq: ZO 160 or ZO 250 or BIO 125 or BIO 183.* The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.

ZO 419 Limnology. *4(3-3-0) . F. Preq: BIO 360 or ZO 260.* Structure and function of lakes and ponds, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals, and effects of pollution on water quality. One local weekend field trip is required.Credit in both ZO 419 and ZO 519 is not allowed

ZO (FW) 420 Introduction to Fisheries Science. *3(3-0-0) . F. Preq: ZO 150. Coreq: ZO 260 or BO 360.* Role of fish in aquatic ecosystems, fish biology, fish ecology, fisheries management and conservation. Emphasis on aquatic ecosystems and food webs, life history and ecology of important sport and commercial fishes, population and community dynamics, and theory and practice of fisheries management and conservation. Case studies from freshwater, estuarine and marine systems.

ZO 421 Principles of Physiology. *3(3-0-0) . F,S,Sum. Preq: CH 223, ZO 250.* A comprehensive survey of the processes involved in the function of specialized cells, tissues and organ systems. Emphasis on basic concepts with orientation toward mammalian and human systems

ZO 422 Biological Clocks. *3(3-0-0) . S. Preq: ZO 250. Coreq: Credit in both ZO 422 and ZO 522 is not allowed.* The anatomy, physiology, and development of biological clocks in a variety of organisms, including humans.

ZO (FW) 423 Introduction to Fisheries Sciences Laboratory. *1(0-3-0) . F. Coreq: FW (ZO) 420.* General anatomy and identification of common freshwater, estuarine and marine fish, functional morphology, age and growth analyses, fish health and diets. Computer analyses of bioenergetic and population dynamics.

ZO (ENT) 425 General Entomology. *3(2-3-0) . F,Sum. Preq: ZO 150.* Explores the science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and control of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments.

ZO (FW) 430 Fisheries and Wildlife Administration. *3(3-0-0) . S. Preq: PS 201, PS 202; FW (ZO) 420, FW (ZO) 353.* Describes and compares the administrative structures and programs of federal and state fish and wildlife agencies and develops an understanding of the basis on which these agencies function. Evaluates the interrelationships that fisheries-wildlife professionals, special interest groups, public agencies and legislative bodies play in resource management programs.

ZO 441 Biology of Fishes. *3(3-0-0) . F. Preq: BO 360 or ZO 260.* Behavior, evolution, physiology and ecology of fishes, emphasizing their adaptations for life in streams, lakes, and oceans.

ZO 442 Biology of Fishes Laboratory. *1(0-3-0) . F. Preq: BO 360 or ZO 260. Coreq: ZO 441.* Field and laboratory exercises with the common fish species and communities of North Carolina. Field trips to local streams and lakes plus weekend trips to coastal, estuarine, and mountain habitats.

ZO (MEA) 449 Principles of Biological Oceanography. *3(3-0-0) . F. Preq: BIO 181.* Biological productivity and trophic relationships in plankton, nekton and benthos; community ecology of selected habitats (estuaries, intertidal zones, coral reefs, deep sea); and adaptation of organisms to the marine environment.Credit is not allowed for both MEA(ZO)449 and MEA(ZO)549

ZO 450 Evolutionary Biology. *3(3-0-0) . F. Preq: ZO 205, ZO 208. GN 411 recommended..* Principles and patterns of organic evolution. Origin of life, patterns of genetic variability within populations; adaptations, natural selection, and the formation of species. The living world as an historical process governed by diverse principles of organization.

ZO 460 Aquatic Natural History Laboratory. *2(0-4-0) . S. Preq: BO 360 or ZO 260.* Field and laboratory study of taxonomy and environmental adaptations of freshwater protists, plants, and animals. Ecology of principle freshwater ecosystems, effects of pollution, and examples of conservation. Establishment of freshwater aquarium with local organisms. Weekend field trips required

ZO 480 Laboratory Techniques in Cellular Biology. *3(1-6-0) . F,S. Preq: ZO 160 or BIO 125 or BIO 183 and CH 223.* Selected laboratory techniques in modern biological research including immunochemistry, animal cell culture, light microscopy, and detection and isolation of recombinant proteins.

ZO 488 Neurobiology. *3(3-0-0) . F. Preq: ZO 250.* Overview of the neurosciences, with a focus on fundamental principles in the function, structure, and development of the nervous system. Topics include neuroanatomy, electrical signaling, synaptic transmission, sensory and motor systems, neural development, neural plasticity, and complex brain functions. Multiple levels of analysis, from molecular to behavioral, with an emphasis on the mammalian nervous system.

ZO 492 External Learning Experience. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer and the departmental teaching coordinator prior to the experience.

ZO 493 Special Problems/Research Exploration. *1-6. F,S. Preq: Sophomore standing.* A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator prior to the experience.

ZO 495 Special Topics in Zoology. *1-3. F,S.* Offered as needed for development of new courses in various areas of zoology.

A

Index

B

C

D

E

F

Index

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

X

Z