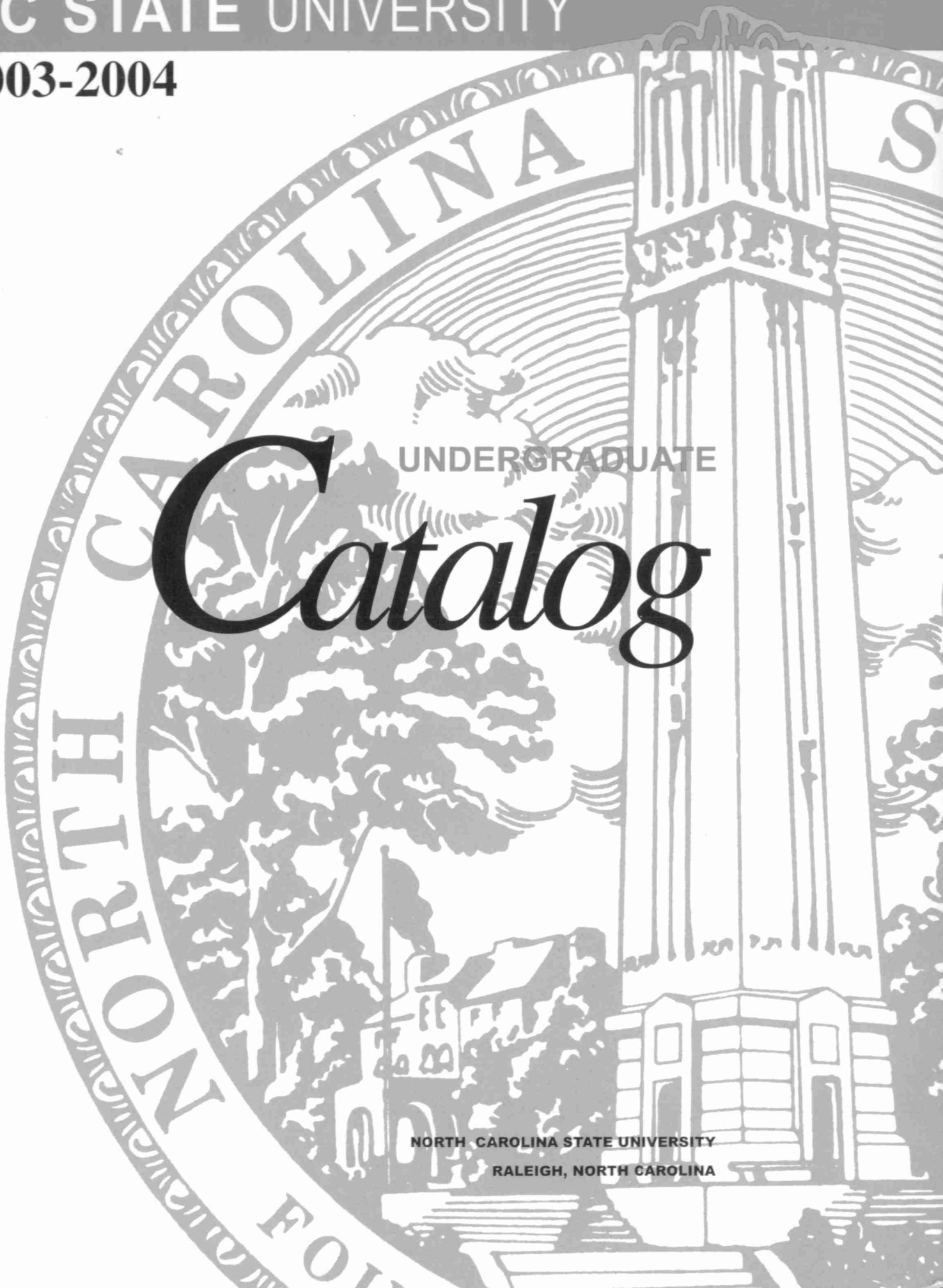
NC STATE UNIVERSITY

2003-2004



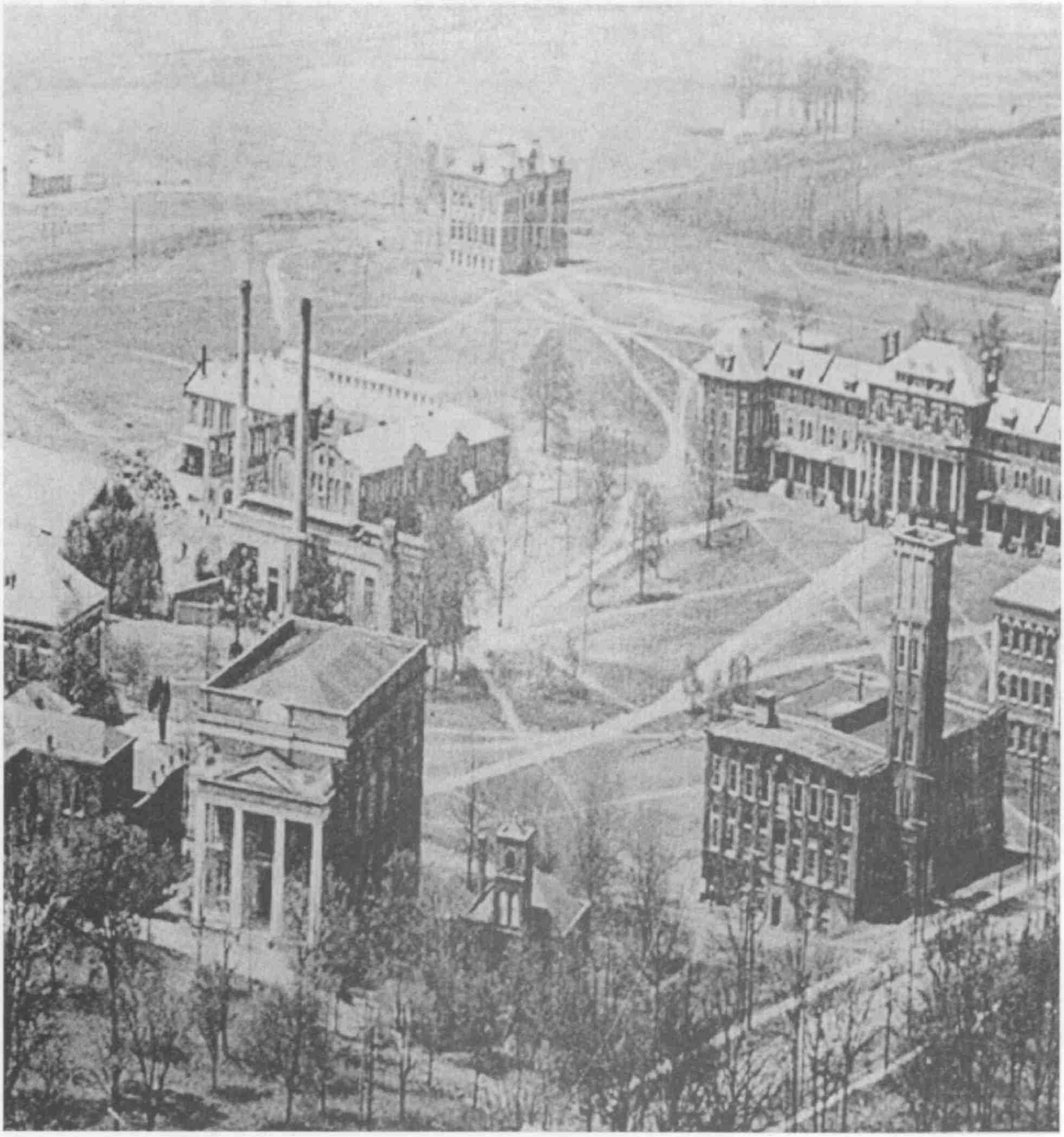
UNDERGRADUATE

Catalog

NORTH CAROLINA STATE UNIVERSITY

RALEIGH, NORTH CAROLINA

North Carolina State University



founded 1887

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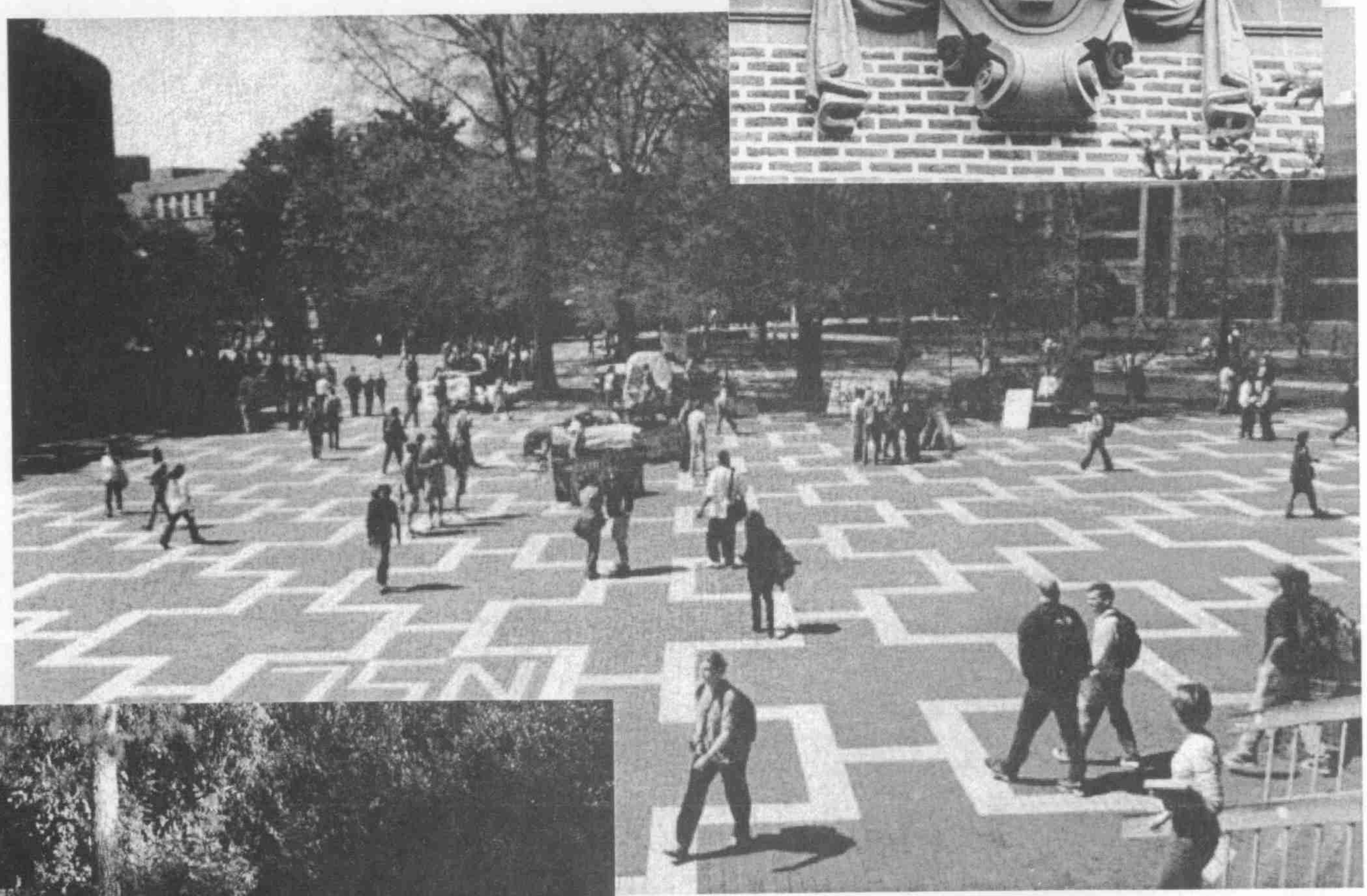

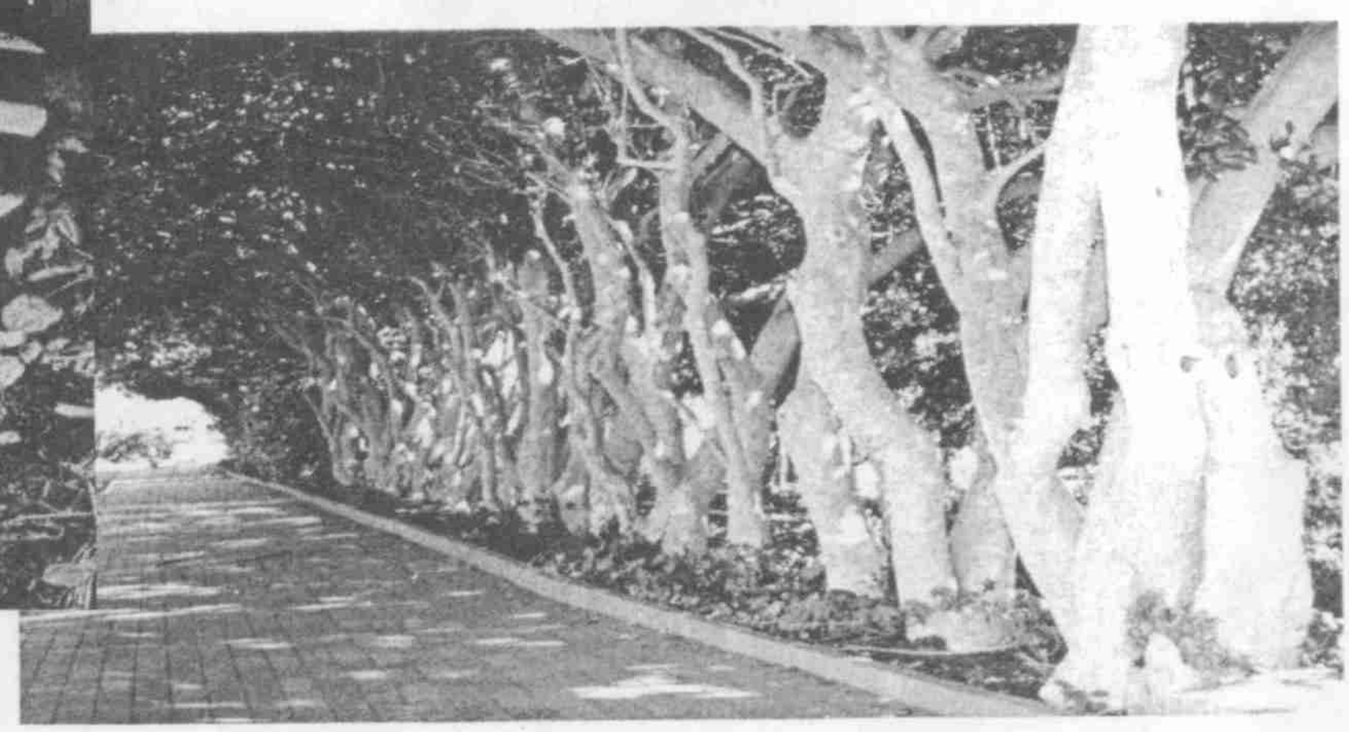

North Carolina State University is a national center for research, teaching, and extension in the sciences and technologies, in the humanities and social sciences, and in a wide range of professional programs.

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 an 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 which 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. 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**, an alumnus and former Dean of the College of Engineering, became chancellor and NC State's eleventh 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, the Centennial Campus celebrated its 10th anniversary and surpassed the $100 million mark in construction. The Engineering Graduate Research Center is the newest building on that campus. In 1994, NC State was authorized to establish the Zeta Chapter of the Phi Beta Kappa Society.

On August 1, 1998, **Dr. Marye Anne Fox**, a chemist and member of the National Academy of Sciences, became NC State University's 12th chancellor to assume the duties of the top post at the state's leading science, engineering and technology university. Chancellor Fox is focused on building the campus community, promoting partnerships, and adopting a business model that works. She co-chaired the first National Academy of Sciences symposium ever held at NC State and encourages further growth on the university's Centennial Campus. Since her arrival, Chancellor Fox has traveled more than 3,000 miles within the state to visit the hometowns of NC State students. She engaged business and community leaders and NC State alumni to learn more about the citizens' needs and the vial role of NC State in North Carolina's economic growth and success.

MISSION OF NORTH CAROLINA STATE UNIVERSITY*

The mission of North Carolina State University is to serve it's 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 North Carolina State University Board of Trustees on April 19, 1996.*

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 101,500 acres.

RESEARCH TRIANGLE

NC State is one of the three Research Triangle 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 6,800 acre Research Triangle Park, location of many public research agencies and private research centers of national and international corporations.

FACULTY

The University has approximately 6,600 employees, of which approximately 1,700 are instructional faculty. Among the many honors and recognitions received by members of the faculty are nine memberships in the National Academy of Science and nine memberships in the National Academy of Engineering, 65 named professorships, 15 University Distinguished Professorships, 138 Alumni Distinguished Undergraduate Professors, and over 435 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 Affairs. The colleges are Agriculture and Life Sciences, Design, Education, Engineering, Natural Resources, Humanities and Social Sciences, Management, Physical and Mathematical Sciences, Textiles, and Veterinary Medicine. These colleges offer baccalaureate degrees in 92 fields, master's degrees in 101 fields, and doctoral degrees in 58 fields. Together with more than 59 research centers and institutes, these colleges also support a broad spectrum of more than 4,000 sponsored scholarly endeavors.

OUTREACH AND EXTENSION PROGRAM

As the state's only research university in the land grant tradition, North Carolina State has a unique mission to serve the citizens of North Carolina 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 every academic college 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 excellence, and leadership development. NC State Extension and Engagement, which encompasses the ten colleges and includes such units as the Cooperative Extension Service, the Industrial Extension Service, the McKimmon Center for Extension and Continuing Education, Centennial Campus, and the NC State Economic Development Partnership, reaches more than one million North Carolinians annually.

STUDENTS

In the 2000 fall semester, the university's head count enrollment totaled 29,637. Included in this number were 20,146 students in undergraduate degree programs, 5,541 in graduate degree programs, 303 First Professional and 3,647 non degree-seeking students. The combined undergraduate and graduate enrollments by college were: Agricultural and Life Sciences - 4,547; Design - 715; Education - 1,246; Engineering - 7,267; Natural Resources - 987; Humanities and Social Sciences - 4,400; Management - 2,661; Physical and Mathematical Sciences - 1,408; Textiles - 724; Veterinary Medicine - 397, and Undergraduate Affairs/First Year College - 1,638. The student population included 2,864 African American students; 2,300 other minority students and 12,685 female students. Students at the university come from all states, four United States territories, and approximately 110 foreign countries. The international enrollment is a distinctive feature of the institution as nearly 1,652 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 Investigates and Colleges, the Oak Ridge Associated Universities, the North Carolina Association of Colleges and Universities, and the Cooperating Raleigh Colleges.

ACCREDITATION

North Carolina State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, Georgia 30033-4097: Telephone number 404/679.4501) to award the doctoral, master's, baccalaureate, and associate degrees.

In addition, many of the University's professional programs and departments are accredited by national professional associations, including:

Accreditation Board of Engineering and Technology	1999
American Animal Hospital Association	2002
American Association for Accreditation of Laboratory Animal Care	2001
American Chemical Society	2001
American Psychological Association	2000
American Veterinary Medical Association	2001
Association to Advance Collegiate Schools of Business	2000
Council for Accreditation of Counseling and Related Educational Programs	1998
Computing Sciences Accreditation Board	1999
Council on Social Work Education	1995
Landscape Architectural Accreditation Board	1999
National Architectural Accrediting Board	1995
National Association of Schools of Public Affairs and Administration	2000
National Council for Accreditation of Teacher Education	2002
National Recreation and Park Association	2002
Society of American Foresters	1995
Society of Wood Science and Technology	1995

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, sex, national origin, age, disability, or veteran status.

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 Nondescrimination Policy**.

For more information, please contact:

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

Phone:919/515.3148
Fax:919/513.1428
TTY:919/525.9617
www.ncsu.edu/equal_op

For further information concerning the following topics, contact the offices listed below:

Undergraduate Admissions
112 Peele Hall University
Box 7103
North Carolina State University
Raleigh, NC 27695-7103
Phone: 919.515.2434
E-mail:Undergrad_Admissions@ncsu.edu
Website: www7.acs.ncsu.edu/uga/

Academic Programs, Office of the Provost
206 Holladay Hall
Box 7526
North Carolina State University
Raleigh, NC 27695
Phone: 919.515.2194
E-mail: academic@ncsu.edu
Website: www.ncsu.edu/academic.html

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Clare M. Kristofco, *Executive Assistant to the Chancellor*
P. J. Teal, *Assistant to the Chancellor for Campus and Community Affairs*
Andy Willis, *Assistant to the Chancellor for External Affairs*

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Vacant, *Vice Provost for Academic Affairs and Chief of Staff*
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Vacant, *Vice Provost for Academic Administration, Budget & Personnel*
Joanne Woodard, *Vice Provost for Equal Opportunity and Equity*
Thomas Conway, *Interim Vice Provost for Enrollment Management and Services*
Denis Jackson, *Associate Vice Chancellor for Extension and Engagement*
Samuel F. Averitt, *Vice Provost for Information Technology*
Susan K. Nutter, *Vice Provost and Director, NCSU Libraries*
Cheryl Branker, *Director, Disability Services for Students*
Ingrid Schmidt, *Director, Study Abroad*
Thomas K. Miller, *Vice Provost for Distance Education and Learning Technology Applications*

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Registration and Records
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Undergraduate Admissions
Thomas Griffin, *Director*

NCSU LIBRARIES

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Jo Allen, *Associate Vice Provost*
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Academic Support Program for Student Athletes
Philip Moses, *Director*
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Communication Technologies
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ACADEMIC CALENDAR

2003 FALL SEMESTER

August	20	Wednesday	First day of classes
September	1	Monday	Holiday (Labor Day) University Closed
October	9-10	Thursday - Friday	Fall Break
October	13	Monday	Classes resume at 8:05am; 8:35am Centennial Campus
November	26-28	Wednesday - Friday	Thanksgiving Vacation for students (no classes)
November	27-28	Thursday - Friday	Thanksgiving Holidays; University Closed
December	1	Monday	Classes Resume at 8:05am; 8:35am Centennial Campus
December	5	Friday	Last day of classes
December	8-16	Monday - Friday	Final examinations
December	17	Wednesday	Fall Graduation Exercise

2004 SPRING SEMESTER

January	1	Thursday	New Year's Holiday; University Closed
January	12	Monday	First Day of Classes
January	19	Monday	Holiday (Martin Luther King Day); University Closed
March	8-12	Monday - Friday	Spring Break
March	15	Monday	Classes resume at 8:05am; 8:35am Centennial Campus
April	30	Friday	Last day of classes
May	3-11	Monday - Tuesday	Final examinations
May	15	Saturday	Spring Commencement

2004 FIRST SUMMER SESSION

May	24	Monday	First day of classes
June	25	Friday	Last day of classes
June	28-29	Monday - Tuesday	Final Examinations

2004 SECOND SUMMER SESSION

July	6	Tuesday	First day of classes
August	6	Friday	Last day of classes
August	9-10	Monday - Tuesday	Final Examinations

2004 FALL SEMESTER

August	18	Wednesday	First day of classes
September	6	Monday	Holiday (Labor Day); University Closed
September	7	Tuesday	Classes resume at 8:05am; 8:35am Centennial Campus
October	7-8	Thursday - Friday	Fall Break
October	11	Monday	Classes resume at 8:05am; 8:35am Centennial Campus
November	24-26	Wednesday - Friday	Thanksgiving Vacation for students (no classes)
November	25-26	Thursday - Friday	Thanksgiving Holidays; University Closed
November	29	Monday	Classes resume at 8:05am; 8:35am Centennial Campus
December	3	Friday	Last day of classes
December	6-14	Monday - Tuesday	Final examinations
December	15	Wednesday	Fall Graduation Exercise

NOTE: This calendar is subject to periodic review and revision. Please consult the University Registrar's website to determine if changes have been made at www.ncsu.edu/reg_records/regi_cal.html.

ACADEMIC FIELDS OF STUDY AND DEGREES

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; botany; criminology; environmental sciences; fisheries and wildlife sciences; food science; horticultural science; microbiology; natural resources; poultry science; zoology.

Pre-professional 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
education, general studies; business and marketing education; mathematics education; middle grades education; science education; technology education

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

College of Humanities and Social Sciences
anthropology; arts applications; communication; criminology; English; English education option; French; French education option; history; multidisciplinary studies; philosophy; political science; psychology; religious studies; science, technology and society; social studies education options: sociology; Spanish; Spanish education option; social work.

College of Management
accounting; business management; economics

College of Natural Resources
environmental sciences; environmental technology; forest management; natural resources; parks, recreation, and tourism management; professional golf management; pulp and paper science and technology; wood products.

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

College of Textiles
textile chemistry; textile engineering; textile and apparel management; textile technology.

PRE-PROFESSIONAL PROGRAMS

Coordinator of Pre-Law Services: Law schools neither prescribe nor recommend a particular undergraduate curriculum for prospective candidates. A student may prepare for law school by a careful use of electives within any of the baccalaureate curricula offered by the nine undergraduate colleges. The Coordinator of Pre-Law Services for the University, in conjunction with the student's academic advisor, assists any student with an interest in law with selection of appropriate electives and concentrations. 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 which have included: local attorneys, Law School students, Law School Directors of Admission, information on the admissions process. At this time, the Pre-Law Advising Program is administratively housed within the Division of Undergraduate Affairs. For further information, consult Mary A. Tetro, Coordinator of Pre-Law Services, 57 Tucker Hall, 919/515.5830.

Pre-Medicine, Pre-Dentistry, and Pre-Optometry Programs: Health professional schools seek bright, broadly educated students from any four-year undergraduate curriculum offered at NC State University. Thus, students should choose a departmental major which suits their interests and talents and which would prepare them for an alternative career should they not be accepted into one of the professional schools.

The program of study should provide a strong foundation in the natural sciences (biology, chemistry, mathematics, and physics), highly developed communication skills, and a solid background in the social sciences and humanities.

The University Preprofessional Health Sciences Review Committee assists students in preparing applications and providing evaluations to professional schools. For further information, consult Professor John Roberts, committee chairman or the program associate, Nancy Cochran (919/515.5978). Detailed preprofessional information may be viewed on the World Wide Web at: www.cals.ncsu.edu/booklet.

PreVeterinary 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 programs 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 a listing of current minors available at NC State, please see the following website: www.ncsu.edu/advising_central/minors.html

Accounting
Africana Studies
Agricultural Business Management
Agricultural & Environmental Technology
American Literature
Animal Science
Anthropology
Apparel Technology
Applied Sociology
Art and Design
Arts Studies
Biological Sciences
Biotechnology
Botany
Business Management
Chemical Engineering
Chinese Studies
Classical Greek
Classical Studies
Coaching Education
Cognitive Science
Computer Programming
Creative Writing
Criminology
Crop Science
Design
Design Studies
Economics
English
Entomology
Environmental Science
Environmental Toxicology
Feed Milling
Film Studies
Fitness Leadership
Food Science
Forest Management
French
Furniture Manufacturing
Genetics
Geography
Geology
German
Graphic Communications
Health, Medicine, & Human Values
History
Horticultural Science
Industrial Design
Industrial Engineering
International Studies
Italian Studies
Japanese
Japan Studies
Journalism
Languages and Culture
Law and Justice
Linguistics
Materials Science and Engineering
Mathematics
Meteorology
Microbiology
Military Studies
Music
Nutrition
Outdoor Leadership
Parks, Recreation, &Tourism Management
Philosophy
Physics
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
Theater
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, two letters of recommendation from a responsible citizen, not a relative, attesting to the prospective student's integrity and character, and a career goal statement. An Associate of Applied Science degree is awarded. Fields of study are:

Agribusiness Management
Field Crops Technology
General Agriculture
Livestock Management and Technology (General Livestock, Poultry, and Swine Options)
Ornamentals and Landscape Technology
Pest Management Technology (Agricultural and Urban Concentration)
Turfgrass Management

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, 103 Peele Hall, Box 7102, North Carolina State University, Raleigh, NC 27695-7102,
919/515.2872.

ART STUDIES

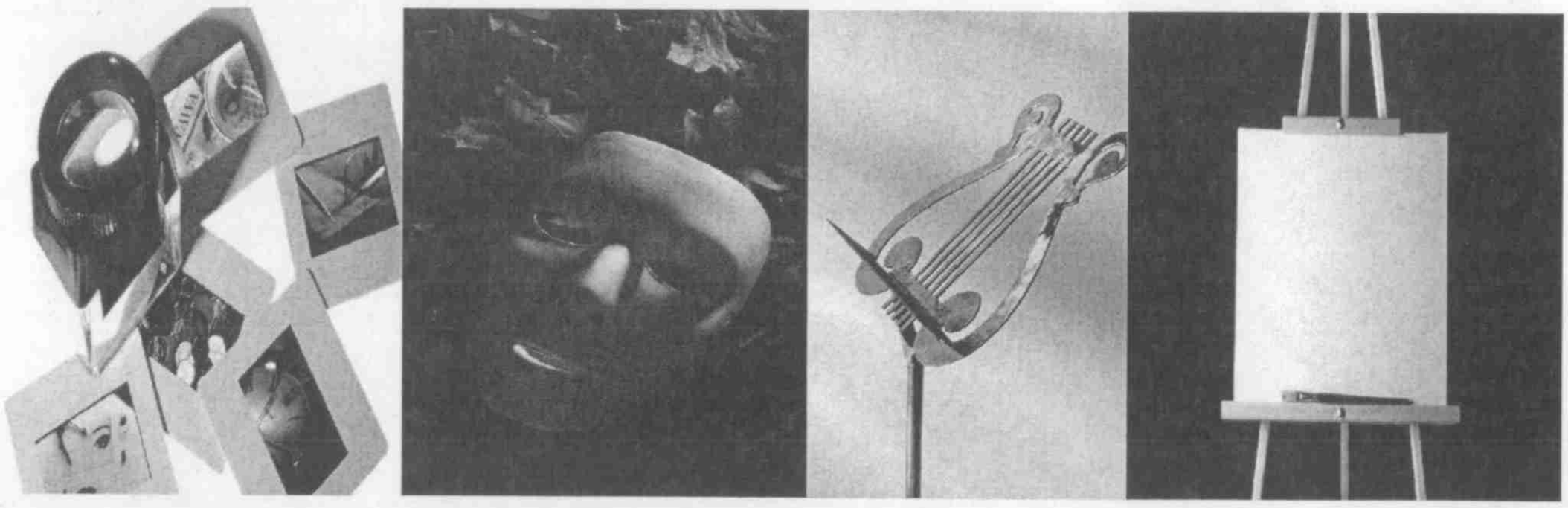
NC State offers a rich variety of courses in the history, analysis, and production of the arts - dance, film, music, theater, and visual arts. Many of these courses are open to students without prerequisite, and are offered by 13 departments in four different colleges of the university.

In addition to these courses, most of which focus on a single art form, the Division of Multidisciplinary Studies offers special topics courses (MDS 295, 494, 495) each of which deals with several arts media or with the arts in connection with science and technology; information about these courses, which change each year, is available from the Office of Multidisciplinary Studies.

For students who want to concentrate in Art Studies, a major in Arts Applications is available. It is administered by the Division of Multidisciplinary Studies 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 may include many instrumental and choral organizations, student productions in Thompson 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.



HONORS AND SCHOLARS PROGRAMS

HONORS PROGRAM

The Honors Program at NC State University provides a unique academic opportunity for a select group of academically outstanding students. Designed to cultivate the next generation of knowledge builders and creative talents, it will broaden experiences in and out of the classroom and position students for admission to graduate and professional schools, for excellent jobs, and for prestigious national scholarships. The Honors Program demands critical thinking, an interest in problem solving and teamwork, a desire to think "out of the box," and the drive to attain an intellectual global perspective across disciplines. Based on specific selection criteria, students are invited to apply for admission to the Honors Program.

Honors students take full advantage of NC State's outstanding faculty who are recognized by their department and by students as being among the most talented teachers and researchers on campus. Most are also recognized nationally and internationally as prominent leaders in their disciplines. Four required interdisciplinary Honors Seminars (12 credit hours), adapted for only 20 to 25 Honors students, are built upon discovery-, inquiry-, and creativity-based learning paradigms. The seminars encourage students to explore the sources of the knowledge being taught (Who discovered/created the work and by what means?), the impact of the discovery/art form on past and contemporary societies (Why and to whom does the work matter?), the ethical and religious issues consequential to the work (How does the work fit into what others or I believe?), and the responsibilities that researchers artists have in generating something new (Is all knowledge taken as good?).

Honors students must complete a minimum of 6 credit hours of Honors Undergraduate Research/Independent Study that culminates in a creative project or thesis. Students work with an NC State faculty mentor (or a scientist/artist/writer outside NC State) on the research/creative project. Students are required to present the results of their work at the NC State Undergraduate Research Symposium or another symposium or exhibit appropriate to the discipline of the scholarly work. Both independent and collaborative work is encouraged throughout the program.

In addition to the seminars, the Honors Program offers a variety of workshops to prepare students for their (1) Disciplinary Honors research/creative project and the oral or poster presentation of the work, (2) application for admission to graduate or professional schools, (3) application for employment and special academic awards, (4) application to study abroad or conduct research/creative projects at national institutes and centers, and/or (5) application for national scholarships and fellowships.

Honors students are invited to reside in the Honors Village, an interactive, learning-while-living community, located on East Campus along with the new Honors Program Office, a new dining hall, and Thompson Theatre. The Honors Student Governing Board provides a variety of free cultural, educational and social events for all Honors students. Honors advisers help students develop a four-year Honors Plan of Study, which will allow students to take advantage of such opportunities as study abroad, internships, or research while completing their degrees in an organized and timely manner; and they offer advice on admission to graduate and professional schools, national scholarship opportunities, or career development resources on campus.

Students invited into the Honors Program at NC State have a full four years of Honors opportunities open to them, depending on their major. In the first two years students participate in four Honors Seminars and various workshops. Students in the junior and senior years get more deeply into the subject of their major through participation in Honors in the Discipline (see list of available college programs) and the diverse honors courses, graduate courses, seminars and research opportunities available. Students not invited into the Honors Program as freshmen may apply to enter as sophomores or may enter Honors in the Discipline by earning the NC State total grade point average required by their disciplines.

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.

Co-sponsored by the Division of Student Affairs, and the academic colleges for over twenty years, the USP has combined special courses offered by the various academic departments with a series of co-curricular 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 are deliberately kept small 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, Honors courses, and regular non-Scholars 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 may include conversations with distinguished faculty members, addresses by major public figures, debates, and discussions on significant public issues, and visits to museums and historic sites. They may 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 Education field trips complete the Scholars Forum. Visits to internationally renowned research centers and local museums, hikes through local nature preserves, and rafting trips down nearby rivers to investigate local flora and fauna are regularly included as part of the Scholars Forum Series. University Scholars also have the opportunity to participate in the USP Outdoor Leadership Experience-trips that combine leadership skills work with rock-climbing, white-water rafting, canoeing, hiking, camping, and other outdoor activities as well as internships opportunities available exclusively to University Scholars: the Centennial Campus Internships, Kenan Fellows Internships, and the ARTS NC State Internship. 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 encourage the development of close working relationships and friendships among participants in the USP, Scholars are invited and encouraged to live in the same residence hall, Sullivan, located on West Campus. To assist and communicate effectively with these students, the USP office is also located in Sullivan Residence Hall.

For more information concerning the USP, contact: University Scholars Program, Box 7316, NCSU, Raleigh, NC 27695-7316, Phone: 919/515-2353, Fax: 919/515.7168; e-mail: University_Scholars@ncsu.edu or visit the University Scholars Program web-site (www2.ncsu.edu/ncsu.univ_scholars/).

SCHOLARSHIPS

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 further 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 at NC State in 1996 with a generous grant from the Park Foundation of Ithaca, New York to fund an inaugural class of 25 Scholars. The merit-based scholarships are full, four-year awards covering tuition and fees, room and board, textbooks, academic supplies, living expenses, and a stipend for a personal computer. Currently, the award is about $12,000 per year for in-state students or about $23,000 per year for out-of-state students.

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. You must be a U.S. citizen to be eligible for the Park Scholarships.

Currently about 60 Park Scholarships are awarded per year. Two-thirds of the Scholarships are currently awarded to North Carolina residents and one-third 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.

North Carolina high schools and selected high schools in other states are invited to endorse up to two of their very best students for the Park Scholarships. We request that high schools announce the competition to their best students and that a committee be established to select and prepare the Park Scholarship candidates. Interested students should speak to their guidance counselor. Note that applications are delivered online directly to the students once high schools have officially endorsed them in the fall.

Under certain exceptional circumstances there may be students with clearly superior characteristics or achievements who do not gain the endorsement of the school but who may be viable candidates for the Park Scholarship. (*e.g.* an outstanding student who just moved and is not well known by the new school faculty and staff.) In these extraordinary cases, such students are welcome to apply directly to the Program by visiting the Park Scholarships website to request an application (www.ncsu.edu/park_scholarships) High schools that are not on our mailing list may also have outstanding candidates who may want to request an application.

The Park Scholarship program has as its namesake an individual synonymous with achievement and success, Roy H. Park '31, a native of Dobson, NC. At NC State, Park served as editor of the *Technician*, the school newspaper. His media interest culminated in his establishment of Park Communications, Inc., which owned and operated newspapers and radio and television stations across the United States. Roy Park brought great honor to NC State because of his remarkable achievements over a long life of service.

UNIVERSITY ACADEMIC SCHOLARSHIP FOR ENTERING FRESHMEN

NC State offers a competitive scholarship program for entering freshmen to recognize and encourage exceptional academic ability and achievement. Graduating seniors of good character and leadership potential who have excelled in their high school academic and extracurricular endeavors may be considered for a number of merit award opportunities at the University. Financial need is not a consideration in the selection of recipients for these awards.

Each year the Office of Scholarships and Financial Aid considers admitted NCSU freshmen for approximately 30 university-wide scholarships available to students entering any academic major. These scholarships are funded by endowments within the University. In addition, approximately 25 University sponsored National Merit Scholarships will be offered to students designated as finalists in the National Merit selection process who indicate NC State as their first choice school. A number of *other* scholarships are also offered through individual colleges and departments.

In order to be considered for both university-wide and college based scholarships, applicants need only submit the NC State Undergraduate Admissions Application by November 1. Based upon the academic strength of the November 1 applicant pool, a pool of students will be selected for review by faculty for designation to specific scholarships.

Chancellor's Leadership Award- 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 Undergraduate Admissions Office.

The John T. Caldwell Alumni Scholarship is sponsored by the NC State Alumni Association as a tribute to John Tyler Caldwell, former Chancellor of NC State. For consideration, entering freshmen should complete the Caldwell Scholarship application and submit a complete admissions application by November 1. Caldwell Scholarships valued at $5,000/year for North Carolina residents and $9,500 year for out-of-state residents are offered each year. This excellent scholarship seeks students who demonstrate both academic excellence and strong leadership potential. It includes stipends for valuable personal enrichment and internship experiences.

Yearly renewal of the Caldwell and the other University-wide renewable awards assumes the maintenance of a 3.0 grade point average once a recipient is engaged in full-time course work at the University.

Many other scholarships, ranging from $2,500 freshmen year awards up to other renewable awards, such as the Caldwells, are available in each year's competition.

Students who are selected for inclusion in this highly competitive pool will be notified of their status with this selection process.

The Office of Scholarships and Financial Aid, NCSU, 2015 Harris Hall, Box 7302, Raleigh, North Carolina 27695-7302. Telephone inquiries are welcome: 919/515.3671

CURRICULUM-SPECIFIC FRESHMAN MERIT SCHOLARSHIPS

There are a number of merit scholarships for students entering a particular college or major. The number and value of these awards vary greatly throughout the different colleges. The individual college Dean's Office is the best place to inquire for additional information on available awards and whether there is an application required for consideration.

Most of the college-sponsored scholarships have a March 1 date for notification of scholarship decisions -- most programs do not request that a special application be filed, just that an undergraduate admissions application with all supporting documents be filed by November 1.

COLLEGE AND DEPARTMENTAL SCHOLARSHIPS FOR CONTINUING STUDENTS

A number of scholarships based upon academic achievement are administered directly through some of the academic departments for students engaged in full-time course work at the University (see the "Colleges, Departments, and Programs of Study" section of this catalog). A continuing student should contact the college/department of his or her academic major for information about specific scholarship opportunities that do not require the filing of financial information.

SPECIAL ACADEMIC PROGRAMS

EVENING UNDERGRADUATE DEGREE PROGRAMS

The College of Humanities and Social Sciences offers courses toward complete 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, multidisciplinary studies, political science, and sociology. For more information, contact the Director of Undergraduate Enrollment Management, College of Humanities and Social Sciences, Box 8101, NC State, Raleigh, North Carolina, 27695-8101; 919/515.3638

NON-DEGREE CERTIFICATE PROGRAMS

Non-degree certificate programs are prescribed sets of regular academic courses which offer limited but structure continuing education opportunities. They are designed expressly for Lifelong Education students. Students enrolled in undergraduate or graduate degree programs at NC State are not eligible to participate simultaneously in these certificate programs. 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 the Office of Adult Credit Programs & Summer Sessions; 919 515.2265

SUPPLEMENTAL INSTRUCTION

Supplemental Instruction (SI) is offered to students in most sections of freshman and sophomore chemistry and selected sections of mathematics, and physics. SI sessions are attended voluntarily by students with a wide range of academic backgrounds and aptitudes. They are open to all students who want to improve their understanding of the course material. Three or four sessions are offered at various times each week, usually during the late afternoon and early evening.

SI sessions give students a chance to get together with peers to compare notes, to discuss concepts, to work problems, and to develop strategies for studying the material. The sessions are led by trained university tutors called SI leaders. Leaders are usually undergraduate students who previously excelled in the course and who have been selected for their outstanding communication abilities. The leaders attend class, take notes, and do homework assignments in preparation for the SI sessions.

During the semester, students may attend as many SI sessions as they wish. Session attendance is recorded for use in data analysis and program improvement. The data reveals a consistent record of higher grades and lower dropout rates for students who regularly attend. Grades also steadily improve with increased SI attendance. Students attending SI at least once a week average a whole letter grade higher than students who do not attend.

For more information, contact the Undergraduate Tutorial Center, 515.3163 or visit our website at www.ncsu.edu/tutorial_center/si.html.

THE PEER MENTOR PROGRAM

The Peer Mentor Program is a student peer adviser program that targets first-year African American, Native American, and Hispanic students. The program recognizes the difficulty most first year students face as they embark upon this new and vastly different segment of their lives, and 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 larger perspective, the program's goals are to increase and maintain the enrollment of minority students and to ensure each student realizes his/her own potential.

African-American, Native American, and Hispanic upperclassmen are selected as mentors through application and interview, and are subsequently paired with one to three first year students. The mentor generally maintains close contact throughout the year with his or her first year student(s) and acts as a "big brother" or "big sister." Whenever possible, the freshmen are paired with upperclassmen who are in the same major and/or college. Through training and personal experience, peer mentors are able to assist first year students with any problems or situation that may arise, refer them to the appropriate university resources, and insure a smooth transition from high school to college. Though it is impossible to determine the many benefits of this program for each individual, the Peer Mentor 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.

COOPERATING RALEIGH COLLEGES

The Cooperating Raleigh Colleges (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. The organization provides the opportunity for students to enroll at another institution for a course or courses not offered on their home campus. Other activities include a cooperative library arrangement, joint student activities, and faculty cooperation and interchange.

Any NC State undergraduate degree student who is enrolled in at least eight credit hours on the NC State campus may take a course at another Raleigh college during a fall or spring semester (except that men may not enroll in courses at Peace College) provided that:

(a) the course is not taught on the NC State campus and

(b) the adviser and dean consider the course educationally desirable.

Students may not register for more than a total of two courses in any semester at other CRC colleges. Under extenuating circumstances, exceptions for an additional course registration may be approved by the requesting student's school dean.

Home campus students have first priority in class assignments. Courses taken at other institutions may be used as free electives and as alternatives to restricted electives, if so approved by the student's adviser and dean. Credits earned in this manner may apply toward fulfilling graduation requirements, but grades from other CRC institutions are not used in computing a student's NC State grade point average. Under this agreement, regular tuition and fees are paid to NC State. Certain special fees may be required for special courses at other colleges, and the student is responsible for paying such fees. During the summer, there is no interinstitutional program with local colleges. A student desiring to take a summer course must register directly with the institution offering the course.

Note: Lifelong Education students may not register for courses as interinstitutional students.

NATIONAL STUDENT EXCHANGE PROGRAM

NC State is one of over 167 colleges and universities in the United States belonging to the National Student Exchange Program. Each year an opportunity is provided for NC State students to study at one of the other participating schools and still pay the same tuition and fees they pay at NC State, thus avoiding the red tape normally associated with a change of school. Students returning

from exchange reflect an increased feeling of independence, self reliance, and self confidence, and a better appreciation of home region, family, and home campus. A major impact of the exchange year has been an increased awareness and appreciation for the vast difference in ideas and values found in different geographic locations. Eligible students must be an undergraduate with a 2.5 grade point average or better and be selected by a screening committee. Preference is given to North Carolina residents. For further information contact the National Student Exchange Office in 2120 Pullen Hall, 919 515.3499.

NORTH CAROLINA STATE CALDWELL FELLOWS PROGRAM

NC State offers a self development experience known as the NC State Caldwell Fellows Program. The program is designed to assist outstanding freshmen students develop their leadership potential at an accelerated pace, and to accomplish this in ways not usually afforded by the University. Each year approximately 30 new freshmen are selected to participate in the program as Caldwell Fellows. They receive a stipend that approximates in-state tuition and fees, as well as the opportunity to apply for additional support for leadership and self-development activities. The program seeks to identify students of exceptional ability and motivation and to encourage their development as potential leaders for business, governmental, educational and other professional communities. The program attempts to fulfill its goal by providing training and developmental opportunities.

NC STATE INTERNATIONAL PROGRAMS AND ACTIVITIES

INTERNATIONAL STUDENTS

The Office of International Scholar and Student Services (OISSS) is available to assist with questions regarding admission and enrollment at NC State. OISSS is charged with meeting the administrative, advising, and programming needs for the approximately 2,500 non-immigrant students, staff and faculty at NC State University. Services provided by OISSS include advising students on immigration regulations and University policies; counseling students on their academic, financial, and personal problems; and providing cultural programs designed to enrich the cultural and academic experience of international students: New International Student Orientation, International Friendship Program, Culture Corps, I-SSERV volunteer program, Global Gatherings, Cultural Crossroads, and the English Conversation Club.

International applicants must apply to the admission office by the stated deadlines and must meet all the necessary requirements for admission. In addition, international applicants must meet certain language requirements (see the section on TOEFL) and financial criteria (see the section on Financial Information).

TOEFL

Students 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 for university course work. A minimum score of 550 with scores of 50 or above on two sections are required for admission to this University. A minimum score of 213 is required for the computer based TOEFL exam. Some departments may have higher score requirements.

Financial Information

Federal Regulations require that NC State University have documentary evidence on file that a student has sufficient financial means to pay all tuition, required fees, and living expenses for him/herself and any dependent family members for the entire duration of the student's proposed study (4-5 years for a Bachelors). A single student will need approximately $27,500 for the 2003-2004 academic year to cover tuition ($16,750), living expenses ($9,000), and books/required medical insurance ($1,750), for 9 months. A student who plans to remain in the US in the summer will need an additional $3,000 for living expenses.

International students have additional requirements and restrictions depending on their visa status and are responsible for maintaining their lawful non-immigrant status. These regulations and rules are explained at New International Student Orientation, various workshops throughout the year, literature available at OISSS, and on our website. International students in F-1 or J-1 status must especially be careful to maintain full-time enrollment, not work without authorization, carry the NC State University Health Insurance plan each semester, not allow any important immigration documents to expire, immediately notify OISSS of any address or name changes, request permission from OISSS before under-enrolling or changing majors, etc.

For further information, contact OISSS, 208 Daniels Hall, Box 7222, Raleigh, NC 27695-7222, or you may also call 919/515.2961, or e-mail oisss@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 Cindy Allen at 919/515.8171 or cindy_allen@ncsu.edu

ALEXANDER INTERNATIONAL PROGRAM

Each year, students from an average of 20 countries worldwide enter the University through the Office of Study Abroad. The majority of these students are assigned to Alexander International Hall for their term (semester or year) at North Carolina State University. Additionally, many degree-seeking international students choose to live in Alexander during their tenure. Roommates (one international student and one American student) are paired to live together through their personal preferences. Combining the international and American students alike, the majority of residents in Alexander International Hall are upper class and graduate co-ed students.

Residents in Alexander International Hall represent more than 25 countries. This makes for a very rich and diverse culture within the hall. Relationships between residents are fostered through pairing international students with American students to create a live and learn environment. It is typical to find many students cooking native foods and conversing in native languages while educating others about their cultures. Resident Advisors (RAs) and Hall Council members are active in planning programs that encourage resident participation, such as cultural dinners and international film festivals. International and American residents are usually very eager to share their cultures and learn about other traditions.

Program activities in past years have included both an international dinner and international coffeehouse series, emphasizing customs, foods, and entertainment from various cultures. Workshops on cultural differences, cross cultural communication and relationships, international employment opportunities, and overseas studies are regularly included in the annual calendar of programs and activities. These activities provide an opportunity for American students to add an international dimension to their education while attending NC State.

Participation in this international program is selective and based upon potential contributions to the program. Students are expected to be active participants, to initiate programming, and to be supportive of the program goals. Students interested in applying or wishing additional information should inquire at 105 Alexander International Hall, 919/515.3130.

STUDY ABROAD

The Study Abroad Office assists students who would like to study, do an academic internship, volunteer, or work in another country. Opportunities are available for the summer, semester, or year, and 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 Fulbright. Students may also use their financial aid to study abroad.

STUDY ABROAD PROGRAMS

Study programs abroad allow students to take course work overseas in their major and/or minor field, and/or fulfill general education requirements. Programs are available for the summer, the semester, or the year. 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:

NC State Exchange and University of North Carolina Exchange Programs are available (as of this printing) in Ecuador, Mexico, Spain, the United Kingdom, Hong Kong, Singapore, Taiwan, Denmark, Austria, Brazil, Poland Ireland, France, Finland, Sweden, the Netherlands, Germany, Japan, and Australia. Students on these exchanges pay regular NC State tuition. Room and board costs are paid to the host institution, but are typically very similar to those at NC State. 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.

The International Student Exchange Program is available in Ghana (West Africa) and Spain. Students on these programs pay a set program charge which covers the cost of tuition, housing, airfare, excursions, insurance, and meals. Requirements include a GPA of at least 2.75 and completion of at least the 202 level of Spanish for the Spain program.

NC State Semester and Year Study Abroad Programs are directed by NC State faculty. There are over 20 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 who have completed the freshman year. Students typically earn 3 or 6 hours of credit on summer programs. The programs below will be offered in the summer of 2003. For the list of programs for the current year contact the Study Abroad Office, Box 7344, Study_Abroad@ncsu.edu or see the website http:www.ncsu.edu/studyabroad.

VIENNA, AUSTRIA. This program offers five courses: "Vienna in 1900", which includes the art, music and literature of Vienna from 1885 to 1914; "Vienna, East Central Europe and the European Union"; "Contemporary Science and Human Values in Vienna, 1918-1990"; and Intermediate German language, FLG 201 and 202. Prior knowledge of German language preferred but not required.

GUATEMALA. This is a 6 1 2-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 sociocultural and economic issues surrounding Guatemala's tourism industry. Courses are taught in English.

PRAGUE, CZECH REPUBLIC. Located in Prague, one of Europe's most beautiful and historic cities, this 6-week program offers credit hours from the School of Design. Courses in landscape architecture, art and design are offered as studios. Study of architecture and urban planning consists of two 3-credit courses. Courses are taught in English.

LONDON, ENGLAND. This program provides American-style university-level classroom instruction in the heart of London. NC State professors teach an arts course focusing on the arts, architecture, music and theater or London and a course on how the city of London is represented throughout British literature. Students reside and study at Canterbury Hall, a University of London residence hall located in the Bloomsbury section, within walking distance of the British Museum, Charles Dickens House, and the theater district.

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 St. Benet's 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.

LILLE, FRANCE. This 5 1/2-week program begins with a travel study through northern France, with visits to include the Loire Valley chateaux, Mont-St. Michael, Versailles, Chartres, and the D-Day beaches of Normandy. The program will then continue for four weeks at the Catholic University of Lille, where students will live with French families. Students will take one language course (beginning, intermediate, or advanced French) and one French civilization course for a total of six credit hours; previous study of French is not required.

NEW DELHI, INDIA. This is a five-week program in Hindi Language and Indian Culture. Students will spend five weeks on the campus of Jawaharlal Nehru University on the outskirts of the city. The political capital of an enormous, diverse nation, New Delhi is a cosmopolitan city with world class shopping, restaurants, and historical monuments. The program will include excursions to Uttar, Pradesh, Rajasthian, and a Himalayan hill station. No previous study of Hindi is required. Literature and culture courses taught in English.

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 Italia Renaissance period. Six credits are available through a a variety of courses including art history, studio art, and Italian language, taught by the outstanding faculty at the Lorenzo de Medici Institute. The course "Italian Renaissance Civilization and Culture" is required for all participants.

LIMA, PERU. This six week program begins with a twelve-day travel study focusing on the Inca and colonial heritage of Peru, 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 (participants must have completed FLS 202 prior to beginning the program).

CUERNAVACA, MEXICO. This language and culture immersion program is located 70 miles south of Mexico City in the city of Cuernavaca, called the City of Eternal Spring because of its mild sunny climate. Students live with Mexican families and attend the Center for Bilingual and Multi-cultural studies.

GHANA, WEST AFRICA. (Humanities) Offered through the African-American Studies Minor program, this program offers course work and immersion in African culture. Courses include "Ghanaian Culture and Society", "History, Politics and Economic Development of Ghana", and "Social and Psychological Health Issues in an African Context" and a Twi (Akan) language course.

GHANA, WEST AFRICA. (Art and Design) This program offers course work in Art and Design (sculpture, textiles, ceramics and painting) and Ghanaian art history. Based at the University of Science and Technology in Kumasi.

AIX-EN-PROVENCE, FRANCE. The 2 1/2 week program in Aix-en-Provence offers three hours of course credit for BUS 464: International Marketing. The program has two prerequisites: BUS 360: Marketing Methods, and FLF 101: Elementary French, or its equivalent. Aix is famous for its grand boulevard- the Course Mirabeau- and open squares that feature bustling markets in the mornings and outdoor bistros and cafes in the afternoons and evenings. Located 20 minutes from the Mediterranean Sea, Aix enjoys long, sun-drenched summer days. The course is taught in English.

NATAL, SOUTH AFRICA. This program provides a wonderful opportunity to study in KwaZulu-Natal, the most culturally diverse region in South Africa, for a five-week period. Students have the opportunity to experience Zulu history, language and culture, issues of politics, policy and community service, and the rise of art, architecture and film in modern Southern Africa as well as ideology and identity.

TANZANIA, EAST AFRICA. This intensive 5 week program in Arusha, Tanzania offers 2-3 credit hour courses: African Culture and Society and Globalization and the African Diaspora. Classroom lectures are supplemented by trips to various sites in the region. All students receive introductory courses in the "KiSwahili" language. Arusha is located on the slopes of Mt. Meru and in close proximity to Mt. Kilimanjaro.

ROSTOCK, GERMANY. This three-week program is intended to give students an opportunity to select from four tracks of study, including life sciences, engineering, & environmental technologies, built around a unique field environment. A variety of cultural activities are planned that include weekend visits to Berlin and Hamburg and other important historical sites. Social activities

involve opportunities for interaction with counterpart German students. Housing options include family home stays, shared accommodations with German students, or a modern youth hostel. Courses are taught in English.

IRELAND/SCOTLAND STUDY TOUR. A unique 14-day study tour opportunity through Ireland and Scotland for undergraduates interested in Agriculture. Tour includes visits to a variety of cities including Dublin, Galway, and Belfast. Also included are visits to dairy, wild boar, and poultry farms.

SHIZUOKA, JAPAN. This 3 week program in Shizuoka, known for its blend of coastal and mountain scenery (including Mt. Fuji), includes lectures by local scholars on various topics ranging from comparative US and Japanese culture to Japanese youth culture, Haiku poetry, green tea culture, local history, and traditional Japanese religion. Included in the program are two-day trips to both Tokyo and Kyoto, capitals of contemporary and traditional Japan. Courses are taught in English.

READING/LONDON, ENGLAND. This 6-credit graphic design studio course is designed for Graphic Design majors. This seven-week program includes six weeks in Great Britain and travel to Glasgow, Cambridge, Oxford, and other sites. Structured design-oriented exploration of city and environs: museums, galleries, libraries, archives, design schools and professional studios. Includes practical design projects using facilities of Department of Typography at University of Reading.

SEGOVIA, SPAIN. The 5-week Segovia program is sponsored by the College of Humanities and Social Sciences and the College of Engineering at NC State. 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 questions of the relationship between technology and culture and in finding their place in our global society. Classes encourage the ability to use the language in authentic settings and allow students to study and experience the rich culture of Spain. The minimum language pre-requisite is two years of high school Spanish or equivalent. Students take two courses for a total of six credit hours.

Volunteer and Work Abroad Programs. In addition to the academic programs listed above, the Study Abroad Office can provide information about a wide variety of volunteer and paid work options around the world which students may wish to participate in.

NC STATE ADMISSIONS

The "Early Action" freshman application deadline is November 15. "Early Action" applicants will receive a response by early January 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 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 applications by December 1. The College of Design does not admit students in the spring. Each applicant must complete an application form which may be obtained from high school counselors or by writing to:

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

A non-refundable $55 fee must accompany the completed application.

FRESHMAN ADMISSION

Admission to the University is competitive, and it is possible to be admissible 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. Applications which are not admissible in the first curriculum choice will be reviewed for admissibility in their second curriculum choice. Transfer between programs after a successful first year may be possible. The admissions decision is based primarily on the evaluation of 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 Scholastic Assessment Test (SAT) or the American College Testing Program (ACT). Extra-curricular involvement and leadership are also considered. These factors are reviewed with the curriculum choice to determine admissibility as a freshman at NC State.

In addition, the Board of Governors of the University of North Carolina System has determined that the minimum undergraduate admissions 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. Three course units of mathematics in any of the following combinations:
   - Algebra I and II, and Geometry
   - Algebra I and II, and one unit beyond Algebra II or
   - Integrated Math I, II, and 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

Beginning with the freshman class entering in the fall, 2006, an additional unit of mathematics beyond algebra II or integrated math III will be required as well. It is recommended that every student take a foreign language course and a mathematics course in the senior year. Any additional entrance requirements for admission to NC State will be set forth in the Freshman Admissions Bulletin for that year. The faculty members of the University Undergraduate Admissions Committee must approve any exceptions to the University admission requirements.

Applicants are accepted on either junior or senior test scores, although senior scores are recommended, especially if the applicant is also applying for financial aid or scholarships. An interview is not required and does not weigh in the admissions decision; a prospective student is always welcome to visit the Admissions Office, 112 Peele Hall. The Admissions Office conducts freshman information sessions every Monday, Wednesday, and Friday at 10:30am and on Tuesday and Thursday at 1:30pm. Campus tours led by students are conducted each weekday, weather permitting, at 12:20pm on Monday, Wednesday, and Friday, and at 2:30 on Tuesday and Thursday, leaving from the Talley Center fountain.

Two-Year Agricultural Institute

Requirements for admission to the Agricultural Institute, a two-year terminal program, include graduation from an accredited 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. The application should include either a copy of high school records or a letter indicating the applicant has passed an equivalency examination. 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 (AAS) degree. (See College of Agriculture and Life Science).

Standardized Test Scores

Applicants for admission as freshmen must submit scores from the College Board Assessment Tests (SAT) or the American College Testing Program (ACT). Students should request that their scores be sent directly from the testing service to NC State. (SAT Code #5496, ACT code #3164) Information booklets and applications 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 Records Department
P.O. Box 451
Iowa City, Iowa 52243-0451

SAT II (Achievement Tests)

Freshman students must present SAT II Mathematics Subject Test scores to ensure proper math placement at NC State. Students should take the Level II-C test.

Advance Placement (AP)/International Baccalaureate (IB)

A student may qualify for advance 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 verbal portion of the SAT; (3) by meeting a specific minimum score on certain of the Advance Placement Program (AP) or IB examinations; and (4) by attaining a minimum score on certain of the College Level Examination Program (CLEP) subject tests.

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 accepting 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. The grade point average required varies, depending upon the requested program of study. Additional specific course work is required for some programs. 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, 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 are carefully screened for evidence of English language proficiency, adequate financial backing and academic credentials indicating potential for success.

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

The Lifelong Education student classification is designed for residents of the Triangle area 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 through the Office of Adult Credit Programs & Summer Sessions, at the McKimmon Center, corner of Western Boulevard and Gorman Street. 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. Lifelong Education students wishing to become graduate degree candidates must make application through the Graduate School and should consult the Graduate Administrator in the chosen field of study for advice or clarification of information.

SERVICEMEN'S OPPORTUNITY COLLEGES

NC State has been designated as a member of the Servicemen's Opportunity Colleges (SOC) General Registry - a network of institutions sponsored by the American Association of State Colleges and Universities and the American Association of Community and Junior Colleges. Servicemen are encouraged to take college level courses offered by accredited institutions and made available to military personnel through SOC. Transcripts must be sent to the Director of Admissions directly from the institution offering the course. Servicemen should submit an application for admission not more than one year before desired date of entry as a degree candidate.

COLLEGE LEVEL EXAMINATION PROGRAM (CLEP)

The College-Level Examination Program® or CLEP is a national credit-by-examination program that provides students with the opportunity to demonstrate college-level achievement through a program of exams in undergraduate college courses. By proving satisfactory knowledge of a test subject, 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 them 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:

45 Columbus Avenue, New York, NY 10023, 212/713.8000 or refer to their website at: www.collegeboard.com/clep/

For information about the exams and required sources accepted by NC State and the corresponding NC State course credit granted, please refer to the following website: www.ncsu.edu/uga/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 web site at www.fis.ncsu.edu/grad_publicns/handbook/

NEW STUDENT ORIENTATION

Leazer Hall
Roxanna S. McGraw, M.Ed., *Interim Director*

The mission of New Student Orientation is to provide 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 education 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. As a component of the Division of Undergraduate Affairs, the Office of New Student Orientation is also committed to providing leadership to enhance programs that respond to student transition needs.

REQUIRED IMMUNIZATION DOCUMENTATION

North Carolina state law requires all new enrollees in the university system to present proof of immunization prior to completion of registration.

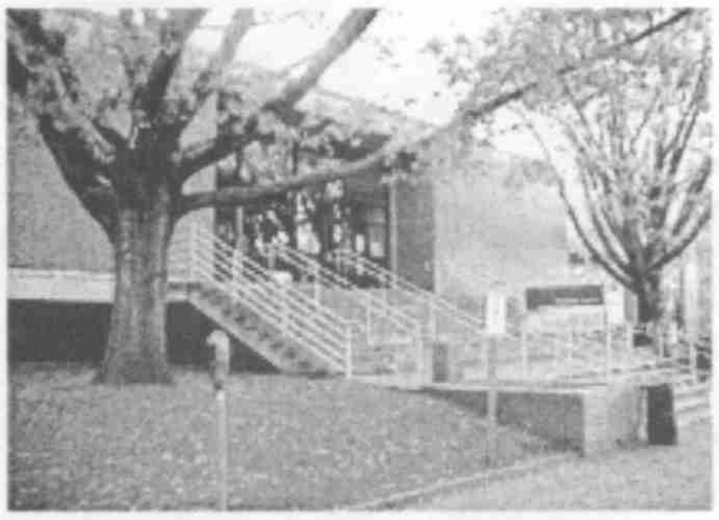
Verified proof of immunization against rubella, measles, tetanus, and diphtheria must be presented to Student Health Services no later than the first day of classes. A PPD skin test within 12 months of the first day of class is required for international students. If the immunization requirement is not met, dismissal from school is mandatory under the law. For assistance, contact Student Health Services, 919/515.7233.

REGISTRATION

Registration is conducted either by using the Web **TRACS LINK** or by telephone. A Schedule of Courses is available for each semester prior to the beginning of the registration period. This contains all necessary instructions for completing registration.

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 **TRACS** system; and (3) paying tuition and fees and all other debts to the University by the established deadlines. Instructions for completing registration are issued each semester and summer session.

For more information, contact the Department of Registration and Records, 1000 Harris Hall, 919/515.2572.



INTERINSTITUTIONAL REGISTRATION

A regularly enrolled undergraduate degree student who is enrolled in at least eight credit hours at NC State may take, under certain conditions, course work at one of the Raleigh colleges, at the University of North Carolina at Chapel Hill, at the University of North Carolina at Greensboro, at Duke University, or at North Carolina Central University. Interinstitutional registration forms and all registration procedures are available from the Department of Registration and Records, 1000 Harris Hall.

SCHEDULE CHANGES- DROPS AND ADDS

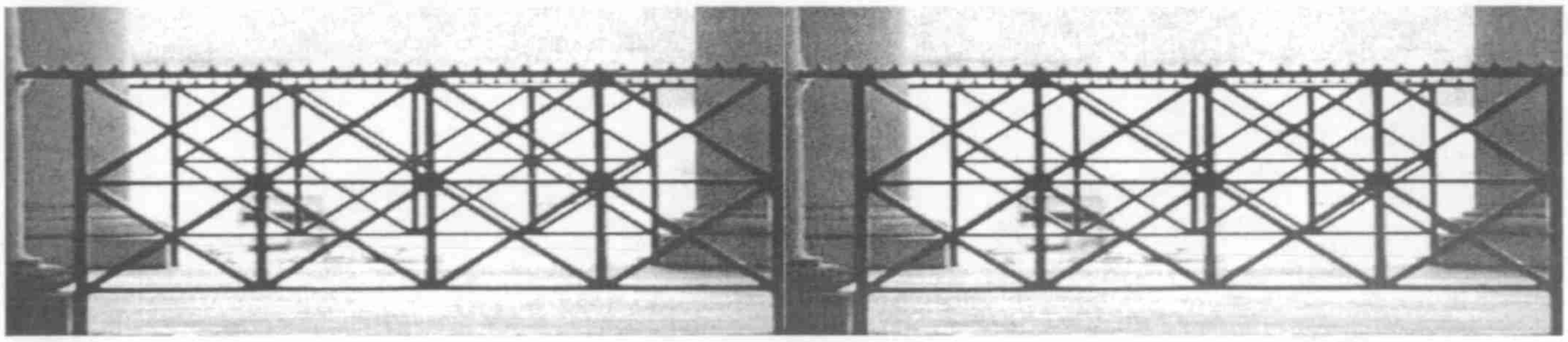
Note: NC State University policies, rules and regulations are continuously being updated and reviewed as the need arises. For the most current information regarding this section, please visit the following website: www.ncsu.edu/policies/academic_affairs/REG205.00.3.php.

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.

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, fulltime 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 (or 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 term 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.



NC STATE TUITION AND FEES

Note: Since tuition and fees for the 2003-2004 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: www7.acs.ncsu.edu/cashier/tuition_index.htm.

North Carolina Resident - $1,915.00 per semester (effective 2003-2004 academic year)

Nonresident - $7,557.00 per semester (effective 2003-2004 academic year)

A statement of tuition and fees is mailed to each preregistered student before the beginning of any term. The statement must be returned with full payment or complete verifiable financial aid information by the due date appearing on the statement. Normally, the due date is two weeks before classes begin. Non pre-registered students will be billed for their tuition and fees plus late fees during the next Cashier's Office billing cycle. Fees are the same for both residents and nonresidents and are required of all students. Nonresident students are required to pay an additional $5,642 per semester for tuition.

ESTIMATED ANNUAL UNDERGRADUATE EXPENSES

Tuition and Fees	First Semester	Second Semester	Full Year
NC Residents	$1,915.00	$1,914.00	$3,829.00
Out of State Residents	$7,557.00	$7,556.00	$15,113.00
Room Rent	$1,671.00	$1,671.00	$3,342.00
Meals	$1,288.00	$1,288.00	$2,576.00
Books and Supplies	$ 400.00	$ 400.00	$ 800.00
Personal Expenses	$ 600.00	$ 600.00	$1,200.00
Total Tuition and Fees			
NC Residents	$ 5,874.00	$ 5,873.00	$11,747.00
Out of State Residents	$11,516.00	$11,515.00	$23,031.00

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 of $55 must accompany each application for admission.

Room Rent: New incoming students receive room reservation instruction in the letter of acceptance. Continuing students are provided a card with instructions at their residence hall rooms. The 2003-2004 charge for room rent ranges from $1,415 to $1,755 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 plan costs in 2003-2004 range from $710 to $1,360. Other students pay for meals individually at the various dining facilities available both on and near the campus.

Books and Supplies: Books and supplies are usually purchased during the first week of classes directly from the Students Supply Stores. Allow approximately $400 per semester for purchasing books and supplies.

Personal Expenses: Personal expenses vary widely among students but the estimate of $600 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 2003 fall semester, the 2004 spring semester, or the combined 2003 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 which comprise the Engineering Computing Facility.

Students who enroll in a co-op work session will not be billed for the Computing Fee unless they also enroll in NC State 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 at the following website: www7.acs.ncsu.edu cashier.tuition_index.htm.

REFUND POLICY

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. The prorated withdrawal schedule for each semester is publicized through university media after it is established. In some instances, circumstances justify the waiving of rules regarding refunds. An example might be withdrawal because of sickness. 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 from the University Cashier's Office, 2005 Harris Hall or at the following website: www7.acs.ncsu.edu/cashier/forms_index.htm

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 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. A North Carolinian who serves outside the State in the armed forces does not lose North Carolina domicile simply by reason of such service, and students from the military may prove retention or establishment of residence by reference, as in other cases, to residentiary acts accompanied by residentiary intent. In addition, a separate North Carolina statute affords tuition rate benefits to certain military personnel and their dependents even though not qualifying for the in-state tuition rate by reason of twelve months legal residence in North Carolina. Members of the armed services, while stationed in and concurrently living in North Carolina, may be charged a tuition rate lower than the out-of-state tuition rate to the extent that the total of entitlements for application tuition costs available from the federal government, plus less than the out-of-state tuition rate for the pertinent enrollment. A dependent relative of a service member stationed in North Carolina is eligible to be charged the in-state tuition rate while the dependent relative is living in North Carolina with the service member and if the dependent relative has met any requirement of the Selective Service System applicable to the dependent relative. These tuition benefits may be enjoyed only if the applicable requirements for admission have been met; these benefits alone do not provide the basis for receiving those derivative benefits under the provisions of the residence classification statute reviewed elsewhere in this summary.

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.

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, 112 Peele Hall. This information is subject to change.

NC STATE FINANCIAL AID

To be considered for 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) available from high school guidance offices as well as the NC State Office of Scholarships and Financial Aid. 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 are considered on-time applicants and are given first priority for need-based scholarship and grant consideration. In addition to the FAFSA, entering freshmen are encouraged to complete the College Scholarship Service's PROFILE application in the fall of their senior year in high school and have the results of that application sent to NC State. The PROFILE application provides early need analysis information needed by the university in making early scholarship commitments for which need and merit are factors.

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 merit 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.*

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.

OTHER OFFICES 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 and disbursed in the same day, and are intended to provide financial assistance to meet unexpected expenses. Short term loans generally 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 www.ncsu.edu.

NC STATE STUDENT HOUSING

RESIDENCE HALLS

The University operates twenty residence halls across campus for almost 7,000 residents. A variety of residential options are available to accommodate diverse student interests and needs. The residence halls offer single gender and co-ed options in buildings ranging in age from Watauga Hall (1906) to Wood Hall (1983). Each hall is different, with amenities such as computer rooms, laundry rooms, kitchens, and air conditioning available. The professional and student staff members recognize the needs of the residence hall population and strive to provide a challenging yet supportive atmosphere fostering academic success, as well as individual and interpersonal growth.

To be eligible to live in the residence halls during the fall and spring semesters, undergraduate students must be enrolled in at least nine credit hours, while graduate students must maintain at least six credit hours. Students who need to enroll in fewer hours, or who must drop below these minimum requirements during the semester, should contact the University Housing office to request an exception. In certain cases, students may be required to submit a letter of support from their advisor. During the summer sessions, housing is provided for any enrolled student as space permits.

For more information about housing, or to see a 360° view of a residence hall room, contact University Housing online at www.ncsu.edu/housing/index.php, or visit 1112 Pullen Hall, Box 7315, NC State, Raleigh, NC 27695-7315, or call 919/515.2440.

EDWARD S. KING VILLAGE (ES KING VILLAGE)

The University owns and operates 295 apartments (efficiency, one-bedroom, and two-bedroom units). Eligibility to live in the Edward S. King Village is contingent upon being a full-time student at NC State and one of the following: married and living with a spouse and/or children; a single parent living with a child or children for the duration of occupancy; graduate student; married student unaccompanied by spouse or children; or nontraditional undergraduate student.

E. S. King Village staff and the Village Council implement programs and activities for students, spouses, and children. Recreational areas, playground equipment, and other facilities have been recently enhanced to support the family community atmosphere.

For more information about apartment availability at ES King Village, contact us at 919/515.2430.

OFF-CAMPUS HOUSING

University Housing maintains self-help listings of off-campus apartments, rooms, and houses for rent. These listings are not published, but are available in the University Housing Office, 1112 Pullen Hall, during the hours of 8:00am - 5:00pm, Monday through Friday.

The University has no mobile home parking areas, but privately owned mobile home parks are located within a reasonable driving distance of the campus.

FRATERNITIES AND SORORITIES

NC State is home to 43 general college fraternities and sororities. Twenty-five chapters maintain housing for their members. Of those, fifteen reside on Greek Court, a University-owned housing area for fraternities and sororities. Housing costs vary by individual chapter but are generally comparable to University residence halls.

For more information regarding fraternity and sorority housing, contact the Department of Greek Life, 1104 Pullen Hall, Box 7345, NC State, Raleigh, NC 27695-7345, or call 919/513.2910.

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 exceptions to the course drop deadlines, auditing a course before or after taking it for credit, taking a course under the credit by things as exceptions tot he 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 more or more credit hours, registering for Cooperating Raleigh Colleges (CRC) 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 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 Towards Degree

The objective of NC State University's "Progress Towards Degree Regulation" is to encourage timely matriculation into a degree program and reasonable progress towards 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. Beginning in Fall 2006 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 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 towards degree completion, a full-time undergraduate student classified as a freshman must:

1. by the end of the first year of enrollment, 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

2. successfully earn at least 24 credits of NC State or transferable course 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 a 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 Towards 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 towards 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 Towards Degree Regulation see the following website: www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.20php.

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 semesters, 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 of 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.

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.

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.

Note: 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 the Undergraduate Admissions Office 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 the Office of Adult Credit Programs & Summer Sessions which is located in the Jane S. McKimmon Center for Extension and Continuing Education. *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_reg/REG205.00.6php

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. To carry more than the maximum, students must obtain the approval of their adviser and of their

college dean. Undergraduate students who propose to register for 19 or more credit hours a semester must obtain approval from their academic adviser. 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. Exceptions must be approved by the Office of Adult Credit Programs & Summer Sessions.

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 website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.8.php

GRADING SCALE AND GRADE POINTS

Grade	Definition	Grade Points per Credit Hour
A+		4.333
A	Excellent	4.000
A-		3.670
B+		3.330
B	Good	3.000
B-		2.670
C+		2.330
C	Satisfactory ("Passing" for graduate students)	2.000
C-		1.670
D+		1.330
D	Marginal	1.000
D-		0.670
F	Failing	0.000

A grade of a C- satisfies a "grade of C or better" prerequisite and other "C-Wall" requirements.

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 of 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.

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:

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.

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 of 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 must 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 Veteran's 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 Lifelong Education) 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 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 and Aerospace Studies. 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.

Lifelong Education 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 dean of the appropriate school to determine how the work applies to fulfilling the graduation requirements of each student's intended curriculum. 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 school dean in order to insure that the transfer credits will apply toward fulfilling specific graduation requirements. Transfer credit is not recorded on former students' permanent records until after they have been readmitted and have re-enrolled.

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.

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

- **TRACS LINK**: www.ncsu.edu reg_records
- **TELEPHONE**: 515.NCSU (6278)
- Grades are available through **TRACS** at any time while the **TRACS** system is open. Grades are reported within 24 to 48 hours after instructors submit them to the University Registrar's Office.
- **Toll Free**: 1.877.MY.GRADE (694.7233). Grades are provided toll free and are available telephonically during the exam period until approximately two weeks in the next succeeding semester.
- **IN WRITING**: A printed copy of semester grades will be issued only at the written request or authorization 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 and correct correspondence address. Request for printed semester grade reports should be mailed to: Department of Registration, P.O. Box 7313, NCSU, 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 should see one of the Student Services Representatives and show a picture I.D. to receive grades. Office hours are 8:00am to 5:00pm, Monday through Friday.

Change of Name or Address- It is the student's responsibility to notify, either in writing, through R & R online or by telephone (telephone requests will not be accepted during the first week of classes) the Department of Registration and Records, 1000 Harris Hall, Box 7313, Raleigh, NC 27695-7313, www.acs.ncsu.edu/scripts/RegRec/logn_trc.pl, 919/515.2572, of any changes in name or address. Failure to do this may prevent prompt delivery of important University correspondence. News stories about Dean's List students are sent to North Carolina newspapers based on hometown information furnished by Registration and Records.

TRANSCRIPTS OF ACADEMIC RECORDS

Official NC State University transcripts are a complete record of student's academic work at the University. These 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.

An official transcript is issued only at the written request or authorization of the student concerned. Transcript requests must be made in writing, either by mail, FAX, or in person to the Department of Registration and Records, 1000 Harris Hall, Box 7313, NCSU, Raleigh, NC 27695-7313. FAX: 919/515.2376. **TELEPHONE REQUESTS FOR TRANSCRIPTS WILL NOT BE HONORED.**

When making a request, one must include one's full name (including any names you may have used while at NC State), social security number, date of birth, date of last attendance, and the exact address (including ZIP code) where the transcript is to be sent. Requests must include the student's signature.

CHARGES: Request received in person or by mail must be accompanied by a check or money order for $5.00. FAX requests must be signed and accompanied by a Visa or MasterCard number. NOTE: The transmittal of transcripts from the Department of Registration and Records via FAX will be billed to a Visa or MasterCard number at a cost of $10.00 per transcript. These fees are non-refundable.

Transcript requests will normally be processed at time of request. However, a longer period of time may be required for processing at the end of each semester. Official transcripts are not issued for those people who are indebted to the University until such indebtedness is paid or satisfactorily adjusted.

For more information, please contact the Department of Registration and Records, 1000 Harris Hall, 919/515.2575.

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 more 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 (See Appendix W of the Handbook for Advising and Teaching).

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.

If acceptance is approved, a Curriculum Change Form (See Appendix W of the Handbook for Advising and Teaching) will be issued, bearing the signature of the accepting dean.

If the former curriculum was in a different college, the Curriculum Change For 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, preregistration, 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/polices/academic_affairs/pols_regs/REG205.00.16.php

ACADEMIC STATUS

CONTINUATION OF UNDERGRADUATE ENROLLMENT

This policy is effective for all undergraduate students as of the beginning of Fall 1995, and can be found at www2.ncsu.edu/ncsu/provost/info/publications/ugcat/.

Provisions are made for students who were on *Academic Warning I, Academic Warning II,* and *Probation*, and for students who were *Suspended* as of the end of Spring 1995 and who remained suspended as of the end of Summer Session II 1995 are described under the heading "Transition of Continuing Students to the Continuation of Undergraduate Enrollment Academic Policy".

For the most current information regarding this regulation, please visit the following website:
www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.7.php

MINIMUM ELIGIBILITY STANDARD

The minimum eligibility for continued enrollment for any undergraduate student is defined as achieving the required cumulative grade point attempted at NC State plus transferred according tot the Schedule of Performance Requirements for Continuing Undergraduate Enrollment, referred to hereinafter as the continuation schedule.

Schedule of Performance Requirements For Continuing Undergraduate Enrollment*

Credit Hours Attempted at NCSU Plus Credit Hours Transferred	Minimum Required Cumulative Grade Point Average on all Courses Taken at NC State
1-35	1.500
36-47	1.600
48-59	1.700
60-71	1.800
72-83	1.900
84 or more	2.000

Undergraduate students who, at the end of any regular 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 2.0 or better will be eligible to continue in the next regular 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;
- suspended students re-admitted on appeal will be eligible to enroll on Academic Probation.

Every student with a cumulative GPA below 2.0 will be in one of three academic status: Academic Warning, Academic Suspension, or Academic Probation.*

ACADEMIC WARNING

Every student who meets the foregoing conditions but whose cumulative grade point average is less than 2.0, the minimum for graduation, will be on Academic Warning Status. The Timely Advising Requirement applies to all students on Academic Warning Status.*

ACADEMIC SUSPENSION

Students who do not meet the foregoing conditions for eligibility to continue enrollment will be on Academic Suspension Status. Suspended students may be eligible for readmission automatically as provided in the section on "Readmission of Suspended Students." Suspended students not eligible for automatic readmission may appeal to the University Admissions Committee for readmission; they should be encouraged to do so if they feel that circumstances which led to the academic difficulty have changed or can be better accommodated by the student. If readmitted, the student will be eligible to enroll for one semester on Academic Probation Status.*

ACADEMIC PROBATION

Suspended students may appeal to the University Admissions Committee for readmission on Academic Probation Status for one regular semester. Students will not be considered in good academic standing while on Academic Probation Status. Probationary students are subject to the same timely advising requirements as described above for students on Academic Warning. Those with significant involvement in extracurricular activities should be advised to carefully consider the impact of these activities on their ability to succeed academically during the probationary semester and to make adjustments accordingly. The University Admissions Committee may prescribe additional requirements as a condition of readmission. Students who do not complete the probationary semester with a cumulative GPA above the suspension level 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 advisers during the first four weeks of classes in regular semester 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 these requirements to consult with the adviser will not be allowed to register for and continue enrollment at the University during subsequent fall and spring semesters unless the cumulative GPA is 2.0 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/pols_regs/REG205.00.7.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 reapply 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 student who received a bachelor's degree must: apply for admission to the Graduate School and register as a Post-Baccalaureate Studies student through Lifelong Education; or apply for readmission as a candidate for a second bachelor's degree or professional degree or as an undergraduate Unclassified Student.

A non-refundable $25 fee is required for all applications.

READMISSION FOR STUDENTS ELIGIBLE TO CONTINUE

Students who were eligible to continue at NC State at the time of leaving are eligible to be readmitted to their former program provided they have a grade point average of 2.0 on all courses taken at NC State and provided there is space available.

A student who was eligible to continue at the time of leaving who has subsequently taken 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 University Admissions Committee.

A student who was eligible to continue at the time of leaving and whose grade point average is less than 2.0 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 policy; 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.
- Considered for readmission on Academic Probation Status, if the student's grade point average on all courses taken at NC State is such that the student was or would have been suspended.

Former students returning who desire a change of curriculum must have their records transferred to the new college and submit a properly validated Curriculum Change Form to the Department of Registration and Records, 1000 Harris Hall, before readmission can be processed.

READMISSION FOR SUSPENDED STUDENTS

Automatic Readmission

A student who is academically suspended may do one or all of the following:

- enroll in NC State courses during any number of summer sessions at NC State,
- enroll in NC State courses through independent studies, and/or
- enroll in NC State courses via distance education.

For further information regarding distance education, contact the Office of Adult Credit Programs & Summer Sessions, McKimmon Center, 515.2265.

Courses taken at an institution other than NC State or offered by some other institution through Independent Studies do not affect a student's suspension status at NC State.

When by one or all of these methods a suspended student has improved his or her academic standing to the extent that the student is no longer academically suspended, that student becomes automatically eligible for readmission to a regular semester and no letter of appeal to the University Admissions Committee by the student is necessary.

Appeal to University Admissions Committee

A student who is academically suspended, who is ineligible for automatic readmission as described above, may appeal to the University Admissions Committee for readmission. Such students should be encouraged to do so if they feel that circumstances which led to the academic difficulty have changed or can now be accommodated successfully. If granted readmission, the student will be eligible to enroll for one semester on Academic Probation Status. A letter must be written to the Committee stating:

- the reasons for former academic difficulty with an explanation of extenuating circumstances;
- why the student believes he or she can now successfully meet all degree requirements within a reasonable length of time;
- the summer sessions, Independent Studies, or NC State distance education courses that have been completed since being suspended; and
- the address and telephone number that can be used by the Admissions Committee for notification of a decision.

The student must also submit:

- a detailed semester-by-semester plan of work outlining the courses to be taken and the grade point average required in order to complete degree requirements; and
- an evaluation, completed by the student's adviser, department, or college dean's office that provides an assessment of the student's motivation and likelihood of success. In the event that the intended major is not the student's current major, and the student has taken courses in the intended major area, this evaluation should be obtained from the department or college of the intended major. Evaluation forms are available from the Department of Registration and Records.

The Admissions Committee will not act on the appeal of any student currently enrolled in any summer sessions, Independent Studies or off-campus courses until the grades for those courses are recorded on the student's transcript.

Letters of appeal should be mailed to: Department of Registration and Records, Attention: Admissions Committee, NCSU, Box 7313, Raleigh, North Carolina 27695-7313. The letter must reach the Department of Registration and Records by the following deadlines:

- no later than two weeks before the first day of classes in the fall semester for students who did not attend summer school or who attended first summer session only;
- no later than one week before the first day of classes in the fall semester for students who attended summer session; and
- no later than one week before the first day of classes in the spring semester.

The Admissions Committee meets prior to the first day of classes. All material must be received in accordance with the above dates.

Appeal To University Admissions Committee By Students Who Have Not Been Enrolled At NC State For More Than Three Years (Contractual Readmission)

After not being enrolled at NC State, excluding summer sessions, Independent Studies, and NC State off-campus courses) for a continuous three-year period or longer, a student whose former academic records at NC State was such that the student was suspended or would have been suspended under current policies, may petition the University 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 cur-

riculum 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 apply:

1. 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.
2. for courses attempted prior to readmission, only work of C- or better will count toward fulfilling graduation requirements provided that such courses meet current curriculum requirements.
3. 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.
4. the student must maintain an overall grade point average of 2.0 or better on all courses attempted after readmission.
5. 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.
6. a student may only be readmitted once.

Once a student has received notice of readmission, the student should register using telephonic registration. The student's personal 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. (See Registration Cancellation and Refund of Tuition and Fees in the *Handbook for Advising and Teaching*)

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.

1. Degree candidates and Unclassified students initiate the official withdrawal process with the Counseling Center, Student Health Center, 515.2423. Parental approval to withdraw may be required for single students who are under eighteen.
2. Lifelong Education students contact the Office of Adult Credit Programs & Summer Sessions, Registration Desk, McKimmon Center, 515.2265.
3. NCSU students carrying course work at another campus under the interinstitutional arrangement must contact the Department of Registration and Records, 1000 Harris Hall, 515.3048, to initiate the paperwork necessary for removal from the class roll at the other institution.
4. Students visiting from other institutions who are registered for NCSU course work under the Interinstitutional arrangement must initiate withdrawal on their home campus.

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 Fall 1995 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 Summer Session II 1995;
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 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 515.2963 or access the code through the following website: www.ncsu.edu/student_conduct.

NC STATE STUDENT SERVICES

ACCIDENT AND HEALTH INSURANCE

The University offers students a medical insurance program. 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.

THE UNIVERSITY CAREER CENTER

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

To assist in career development, the Center provides individual counseling, campus-wide workshops, and small group career decision-making seminars. Center staff promote, arrange, and coordinate job interviews between students and employer representatives, schedule visits of recruiters to campus, refer employers to view student's on-line resumes, and maintain job vacancy announcements. In addition, career advisors recommend contacts with employers not visiting campus, conduct information sessions on the job search process, and maintain the Center's website. The Center maintains career and job information on-line and through its library. In addition, the Center helps students find internships, summer, and part-time jobs related to their career objectives.

CHAPLAINS' COOPERATIVE MINISTRY

Ann Pearce, Director
3106 Talley Student Center
Box 7306, NC State 27695
515.2414; e-mail: acpearce@unity.ncsu.edu
www.ncsu.edu/for_students/ccm/

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, dialogue, and development 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, 27695
515.9248; email: mike_giancola@ncsu.edu

Baptist Student Union
Kristie Sessoms
2702 Hillsborough Street, 27607
834.1875; email: RaleighBSU@bscnc.org

Brooks Campus Ministry
Donnie Williams
700 Brooks Avenue, 27607
821.2400; email: donnie@brooks.org

Campus Christian Fellowship
Neal Alligood
PO Box 5182, 27650
602.4244; email: noalligo@unity.ncsu.edu

Campus Crusade for Christ

Mike Mehaffie
1912 Myron Drive, 27607
782.3393; email: msmehaffie@aol.com

Catholic Campus Ministry
(Doggett Center for Campus Ministry)
Father Al Dash
600 Bilyeu Street, 27606
833.9668; email: ajdash@unity.ncsu.edu

Disciples Student Fellowship
Rob Morris
718 Hillsborough Street, 27603
832.3953; email: rob@hollyer.ncfast.com

Episcopal Campus Ministry
Rev. Philip Wiehe

2208 Hope Street, 27607
834.2428; email: episcost@bellsouth.net

Fellowship of Christian Athletes
Rev. Steve Wright
3901 Barrett Drive, #304, 27609
787.7211; email: facsteve@nc.rr.com

Grace Community Church
Rev. Berk Wilson
201 Coorsdale Drive, Cary, 27511
467.7670; email: berkwilson@juno.com

InterVarsity Christian Fellowship
Amy Phillips
639 Chappel Drive, 27606
754.8513; email: amy_phillips@msn.com

Lutheran Campus Ministry
Rev. Beverly Alexander
2723 Clark Avenue, 27607
828.1433; email: LCM-Raleigh@worldnet.att.com

Navigators
Todd Harrison
2017 Betry Place
274.5532; email: tkh429@aol.com

Presbyterian Campus Ministry
Rev. Allen Proctor
27 Horne Street, Box 5635, 27650
834.5184; email: allen@wrpc.org

Reformed University Fellowship
Rev. Ben Inman
207 Oberlin Road, 27605
546.0515; email: hermsol@juno.com

Wesley Foundation (United Methodist)
Rev. Kirk Oldham
2503 Clark Avenue, 27607
833.1861; email: raleigh-wesley@nccumc.org

INTERFAITH COUNCIL

The Interfaith Council is sponsored by the Chaplains' Cooperative Ministry as an organization 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 and support the other members in the development of their communities.

Baha'i Club
Omead Ahdieh
Box 7111, NC State Campus, 27695
513.3257; email: bahais_ncsu@hotmail.com
www.ncsu.edu/stud_orgs/bahai

Hillel - Jewish Student Life
Debbie Laxer
8210 Creedmoor Rd, #104; 27613
844.4613; email: debbie@nchillel.org
www.ncsu.edu/stud_orgs.hillel

Latter-day Saints Student Association
Robert Lee
1033 Sturdivant Drive, Cary; 27511
833.3484; email: leere@ldschurch.org
www.ldsces.org/institutes

Muslim Student Association
Emad Ali
P.O. Box 5024, 27605
389.6619; email: esali@unity.ncsu.edu
www.ncsu.edu/stud_orgs/msa

SGI - USA (Buddhist)
Padmini S. Hands
6307 Chapel Hill Road, 27610
832.5083; email: padmini@ncsu.edu
www.sgi-usa.org

Self Knowledge Symposium
Michael Tomlinson
133 Fayetteville Street Mall #600, 27601
782.0212; email: labmonkey@surfy.net
www.selfknowledge.org

COUNSELING

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 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 calling 919/515.2423 or by stopping by the office.

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.ncsu.edu.dining.

DISABILITY SERVICES

Disability Services for Students (DSS) assists students with documented disabilities in obtaining the services for which they are legally eligible and serves all types of disabilities, including those that are hidden. The disabilities may include learning, medical, physical, emotional and/or psychological. They may also be continuous or temporary. To receive services and accommodations, you must contact DSS, Suite 1900, Student Health Center, 2815 Cates Avenue, Box 7509, 919/515.7653 (voice), 919/515.8830 (TTY) or see the following website: www.ncsu.edu/provost/offices/afirm_action/dss.

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 physicians, physician extenders, registered nurses, and other medical support personnel.

Health Services is open for outpatient medical care from 8am to 9pm, Monday through Friday, and 8am to noon on Saturdays during fall and spring semesters (excluding breaks). Physicians maintain regular office hours Monday through Friday and are on call at other times. A nurse staffed clinic is operated during evenings and weekends. Patients are seen by appointment (515.7107); Gynecology (515.7762). Summer session hours are Monday through Friday, 8am to 5pm with no after hours services.

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 student pharmacy, visits to the Counseling Center and to Health Promotion. There is a nominal charge for x-rays, most lab tests, allergy injections, prescription medications and special clinics. Students are responsible for the cost of laboratory tests and x-rays which must be performed by an off-campus agency, medications not available in the student pharmacy, and expenses incurred when referred to an off-campus physician or hospital.

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, and more. Call 515.WELL (9355) for information.

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/Wellness, 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 43 affiliated sport clubs: Aikido, All-Girl Cheerleading, Australian Rules Football, Baseball, Basketball (W), Bowling, Cricket, Cross Country/Track, Cycling/Mountain Biking, Dance Team, Disc Golf, Equestrian, Fencing, Field Hockey, Ice Hockey, Lacrosse (M&W), Martial arts, Outing, Racquetball, Rodeo, Roller Hockey, Rowing, Rugby (M&W), Sailing, Ski & Snowboard, Soccer (M&W), Social Ballroom Dance, Softball, Squash, Swimming, Table Tennis, Tae Kwon Do, Tennis, Triathlon, Ultimate (M&W), Volleyball (M&W), Water Polo, Water Ski/Wakeboard.

Fitness/Wellness

There are over 45 hours of Group Fitness classes each week during the academic year and over 15 hours in the summer. Classes such as step and hi/lo aerobics, cardio-boxing, hip hop, total body conditioning, pilates, mind-body-balance, core resistance training, jump rope, slide, and water fitness classes allow diverse and energetic opportunities to help participants meet their fitness goals. In addition, Fitness/Wellness Educational Workshops are offered that provide knowledge about topics like: injury prevention, time and stress management, relaxation and massage, nutrition, eating disorders, yoga, Latin dance, self-defense, weight training, body composition assessment, and goal setting.

Intramural Sports

Twenty-three team and individual special events and Co-recreational activities are offered through the intramural sports program. Activities include basketball, flag football, soccer, softball, volleyball, badminton, bowling, cross country, golf, tennis, kickball, racquetball, squash, quickball, swimming, table tennis, and track & field.

Outdoor Adventures

Outdoor Adventures offers adventure-based trips, educational workshops, and outdoor equipment check out. Adventure trips are offered by skilled and qualified guides to some of the most pristine areas of this country. 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 check out offers a variety of outdoor equipment at no cost to patrons. Available equipment includes: tents, backpacks, sleeping bags, lanterns, stoves and canoes. In addition, there are hours designated for recreational rock climbing on the indoor rock-climbing wall located in Carmichael Gymnasium.

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

BOOKSTORES

The official campus source for all course books is the NCSU 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. 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, college outlines, greeting cards, 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.

TRANSPORTATION

Transportation strives to improve the quality of life for the NC State community by providing seamless transportation and parking systems. Regulations and requirements exist to facilitate this effort. All vehicles parking on campus must display an appropriate NC State permit. Hours of enforcement are 7:00am to 5:00 pm Monday through Friday in most areas. Residential areas (zones "DW, DE, and N") are enforced until midnight.

All students are encouraged to register for a parking permit on-line corresponding with TRACS registration in the spring. Students must register for each year in order to be assigned a permit. Available permits are distributed based on class seniority and date and time of registration. Permit assignment notifications are sent via e-mail in mid/late summer to the e-mail address on file with Registration and Records. It's important to keep this address updated in order to receive notification.

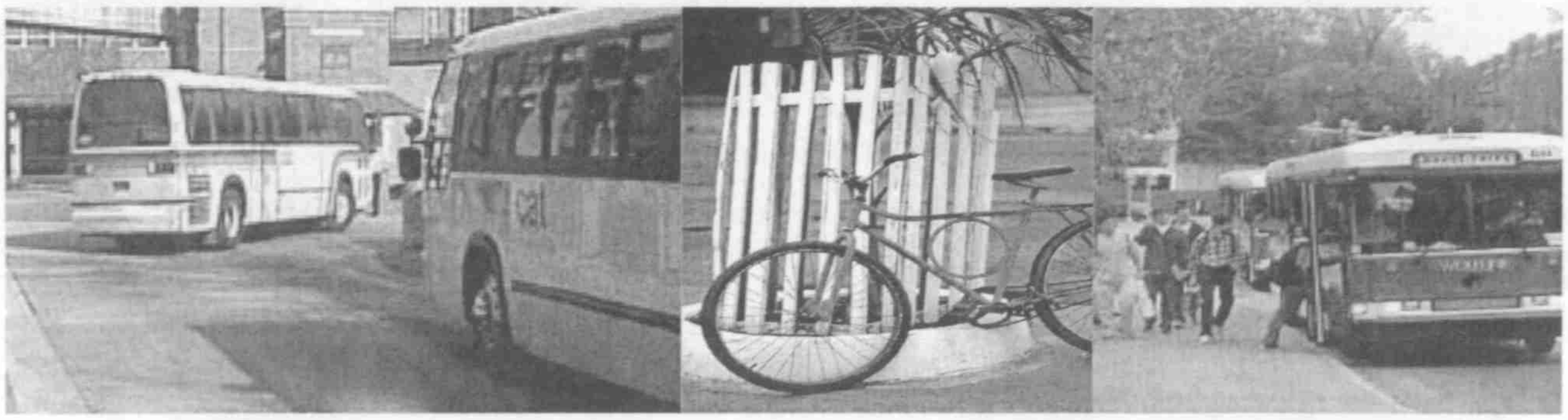
Transportation options include the University's Wolfline bus service, public transit, motorcycles, mopeds, bicycles, car pools, vanpools, and walking.

NCSU Wolfline buses run every day that classes are in session, serving Main and Centennial Campuses, park & ride lots, and official NCSU housing. During the Fall and Spring semesters the Wolfline consists of ten daytime routes and 2 night routes. All routes run every day that students have classes or exams, with four routes continuing to run for staff and faculty during student break days. Daytime bus service begins at 7:00am and continues until 6:00pm. Evening bus service starts at 6:00pm and continues on most days until 2:00 or 3:00am, depending on the day of the week. On weekends, only evening bus service is provided. Buses arrive every ten to thirty-five minutes depending on the individual route and the time of day.

NCSU Transportation is in the second year of a pilot U-Pass program. With U-Pass, all students, faculty, and staff are entitled to ride any Capital Area Transit (CAT) or Triangle Transit Authority (TTA) buses for free, using the NCSU ID card as a boarding pass.

In addition, NCSU Transportation Department offers an award-winning carpool/vanpool program with valuable incentives to participate, rideshare matching, and an Emergency Ride Home program. Cyclists can register bicycles with the Transportation Department

For more information on transportation services, contact NC State Transportation, NC State, Box 7221, Raleigh, North Carolina 27695-7221, 919/515.3424 or visit the following website: www.ncsu.edu/transportation. Don't forget to sign up for the PACK PARKING list serve to keep current on transportation news and events.



NC STATE STUDENT ACTIVITIES

The University makes every effort to provide surroundings, which are pleasant and conducive to intellectual and personal growth. In addition, a wide variety of athletic, cultural and social opportunities are available to students. Though 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, which 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 also have social fraternities and sororities, historically African-American, Native-American, and Latino fraternities and sororities, Greek letter organizations that recruit by academic focus, and those which are formed over common interest such as multiculturalism.

Regardless of affiliation, being Greek means more that just wearing Greek letters, attending meetings, and going to parties. Being in a fraternity/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/sisterhood with individuals who share the same goals and values. Your brothers/sisters are there to support you, making your transition to college easy and fun.

Membership is a solemn commitment. Joining a fraternity or sorority is a lifelong dedication to the ideals and principals of Greek life. Greek men and women are successful in life because the values learned during the undergraduate years of affiliation continue to be put into action long after graduation.

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. 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 edit and manage a variety of student-oriented media. By working with these media, students may gain valuable extracurricular experience in journalism, broadcasting, production and design, leadership and management. There are six media staffed by students and supported in large part by a designated portion of each student's non-academic fees. They are governed by an advisory board with elected student members. Many staff positions are paid.

The Agromeck, the University's yearbook, is published in the fall of each year and provides a record in words and pictures of student and campus activities during the past year; www.agromeck.com. Student staff members include photojournalists, writers, designers, and editors, all with a common mission- to document the history of the university this year. The Agromeck celebrated its 100th anniversary with the 2002 edition.

Americana, NC State's on-line journal of ideas is produced by the students of NC State University; www.americana.ncsu.edu.

The Nubian Message, published once a week, provides news and features about the African-American community; www.nubianmessage.com.

Technician, the University's oldest student newspaper, is published Monday through Friday. More than 50 students produce the daily paper, sell advertising, report, and photograph everything from football games to news conferences. www.technicianonline.com.

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

WKNC (88.1 FM), the student radio station, operates at 25,000 watts, enabling it to be heard in all of Raleigh and surrounding areas. The station operates 24 hours a day using state-of-the-art computers and audio technology with a full staff of engineers, disc jockeys, and news personnel; www.wknc.org.

Several of the colleges have their own publications dealing with material of special interest to students in these areas. The publications include Agriculture and Life Sciences' Agri-Life, Forest Resources' Pi-Ne-Tum; Engineering's The Southern Engineer, Textiles' The Textile Forum; Design's The Publications of the School of Design; and Physical and Mathematical Sciences' The Scientist.

MUSICAL ORGANIZATIONS

Musical organizations are credit-courses that provide opportunities for participants to develop artistically and intellectually through applied music. In 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 which may be used to satisfy free elective requirements in any academic major. Membership in all ensembles requires an audition with the instructor.

UNIVERSITY STUDENT UNION

The University Student Union's Visual and Performing Arts and Activities Programs is the umbrella, organizational structure for most of the major arts and activities programs presented at North Carolina State University. **The Union** seeks to create "A Perfect Union of Arts and Activities" for all members of the University family- students, faculty, staff, administration, alumni, and guests. **The University Student Union** consists of eight arts and activities programs presenting more than 900 evens per year: **Cinematic Arts Program** provides an international film series, a series of independent and experimental film makers, and a popular commercial film series, **Center Stage at Stewart Theater** (presents a wide variety of touring professional performing arts events), **The Crafts Center** (offers hands-on course work in a variety of crafts including pottery, fiber arts, photography, flat glass and woodworking), **Dance Program** (provides credit and non-credit opportunities in dance, with two student dance companies and classes in technique, choreography, and performance), **Music Department** (offers 11 choral and instrumental performance ensembles, available to students for credit and non-credit participation, course work in music theory, history, composition and performances, and an 18-hour music minor), **Student Center Activities Office** (consisting of the Union Activities Board's eight student committees, the Student Leadership Center, and the Cinematic Arts Program), **Thompson Theater** (a student-producing theater, staging up to 13 productions annually, offering credit and non-credit participation in acting, direction, stage management and theater design, and an 18-hour theater minor), **Visual Arts Center** (hosts exhibitions annually, and manages the University's permanent collections of textiles, ceramics, paintings, sculpture, furniture, photography and architectural, visual, graphic and products designs), and four support offices (**Administrative Office, Business and Computer Planning, Reservations Office and Facilities Maintenance**). The University Student Union's programming is housed in four facilities: Talley Student Center, Frank Thompson Building, Price Music Center, and Witherspoon Student Center. Through the programs of the Student Centers, students, faculty, staff, alumni and guests have access to a wide and diverse range of arts, activities, and leadership programs.

ARTS NC STATE

The six visual and performing arts programs of ARTS NC STATE- Center Stage, The Crafts Center, the Dance Program, the Gallery of Art & Design, Department of Music, and University Theater- 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.

CENTER STAGE AT STEWART THEATER

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. (Contact: 513.3030)

THOMPSON THEATER

Thompson Theater is North Carolina State University's volunteer student theater, housed within the Division of Student Affairs. Under the direction of a full-time professional staff, Thompson Theater continues its tradition of quality productions in the performing arts.

Four major shows are produced each season, a children's theater production that also tours North Carolina schools in the spring, two student-directed studio productions, the annual Madrigal Dinner and Theatrefest, a summer season that features local professional and student artists.

Thompson Theater also offers a blend of student volunteer productions and academic theater training. Productions are open to all NC State students, whether or not they are enrolled in theater courses, thus providing an extra-curricular production program.

Classes are available in acting, directing, introduction to theater, and all areas of technical theater, including stage craft, costume, make-up, lighting, and scenic design. Communication majors can receive a Theater Minor. Theater student organizations, open to all NC State students, include University Players, Alpha Psi Omega and Black Repertory Theater.

THE CRAFTS CENTER

The Crafts Center, located on the lower level of the Thompson Building, is an extraordinary crafts facility that is considered to be one of the finest on any university campus. Students can enroll in any of more than 40 crafts classes offered each semester in art, pottery, photography, fibers, woodworking, glass, musical instrument making, lapidary, telescope making and more. Students can work side by side with inspiring crafts people in the numerous studio spaces that include pottery, woodworking, jewelry making, stained glass, photography, optics and weaving. Enjoy examples of both traditional and cutting edge crafts that are regularly on display in the Craft Center's Exhibition Gallery. The atmosphere is friendly and welcoming. Become a member of this supportive family of crafts people. It's a great place to meet people, to learn, and to be creative. Let us answer your questions and give you a tour of this exceptional 25,000 square foot facility. (Contact: 515.2457)

DANCE PROGRAM

The **Dance Program** offers opportunities in performance through two student companies, the NCSU Dance Company, a modern dance company, and DanceVisions, a company whose repertoire ranges from modern to hip hop. Both companies are open by audition, present annual spring concerts, and perform in many other venues on and off campus throughout the year. The Dance Program also presents the Student Concert, an annual formal concert dedicated to choreography by NC State student artists. These students create work in an independent study course with a group of workshop component. The Dance Program offers a non-credit class program open to students, faculty, staff, and the community, and works cooperatively with the Department of Physical Education in offering academic classes in dance. Selected NC State student dancers have the opportunity to work with professional dancers in professional venues through the Professional Projects Program. (Contact: 515.7034)

GALLERY OF ART AND DESIGN

The Gallery 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 Gallery is located on the south side of the Talley Student Center at 3302 Cates Avenue. Exhibitionism the Foundations and Cannon Galleries are free and open to the public. The collection database is accessible through the Gallery website (www.ncsu.edu/gad). 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 Gallery's Administrative Offices. (Contact: 515.3503)

MUSIC DEPARTMENT

The Music Department offers both performing ensembles and academic courses for the music minor program and elective credit. For description of the academic courses, consult the course catalog.

Performing Ensembles. A wide variety of performing ensembles provide opportunities for participants to develop artistically and intellectually through applied music. In 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 which 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 (including Men's Glee Club, Women's Glee Club), University Singers, and The New Horizons Choir. Performance highlights have included concert tours of the Eastern United States, France, and Italy, performances with the North Carolina Symphony and Duke Symphony Orchestras, appearances at the North Carolina Music Educators Conference, 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 and audition with the conductor.

Wind Ensembles. The wind program includes the Wind Ensemble, Concert Band, Jazz Ensembles, British Brass Band, Marching Band and Pep Band. The Marching Band is active during football season; the Pep Bands 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. All Pep Bands members also must be enrolled in one of the above bands or ensembles during the semester they play with the Pep Band.

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.

UNIVERSITY THEATRE

University Theatre is the University's volunteer student theatre, housed within the Division of Student Affairs. Each season, in five main-stage shows, the 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 n 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. Student theatre organizations, open to all NC State students, include Alpha Psi Omega and Black Repertory Theatre. (Contact: 515.2405 or 515.3927)

TICKET CENTRAL

Ticket Central serves as the centralized box office for Arts NC State, the Union Activities Board, and other campus and community events. Ticket Central tickets events in a variety of performance venues including Stewart Theatre, Thompson Theatre, the Talley Student Center, and Witherspoon Student Center. The box office is located on the second floor of the Talley Student Center. Normal hours of operation are Monday-Friday 12-8pm and Saturdays 12-5pm. hours do vary during University Holidays and during the summer. Tickets may be purchased in person or by calling 515.1100.

CENTER FOR STUDENT LEADERSHIP, ETHICS, AND PUBLIC SERVICE

Offered are a variety of programs such as the Leadership Development Series and Service Opportunities that are designed to give all NC State Students the opportunity to explore the nature of leadership and volunteerism are offered. The Leadership Development Series consists of approximately 40 non-credit workshops that focus on different aspects of leadership. The workshops are offered Monday through Thursday evenings. We also list over 100 service opportunities, agencies, and organizations on our web page. For further information and a complete listing of our offerings, please stop by 3115 Talley Student Center, 919/515.9248 or visit our web site www.fis.ncsu.edu/slc.

STUDENT CENTER ACTIVITIES OFFICE

The Student Center Activities Office sponsors the Union Activities Board, the Student Leadership Center, and the Cinematic Arts Program.

The Union Activities Board (UAB) is a student-directed programming network of eight committees which plan and implement a variety of programs for the campus community, including the Black Students Board, College Bowl, Entertainment Committee, Films Committee, Leisure & Recreation Committee, International Activities Committee, and Lectures Committee.

The Leadership Certificate Program. You design! Complete five Core Competency Workshops plus five electives of your choice and receive a Leadership Certificate from your College or School (awarded to currently enrolled NC State students only.)

Descriptive Leadership Transcript. Dynamic resume supplement informs employers of your commitment to developing personal leadership skills. Describes workshops you've completed as well as other accomplishments at NC State.

Role Model Leader's Forum. This program honors an outstanding regional, national, or international leader from business, education, or politics. Each year our Role Model Leader inspires us with their personal view of leadership and the challenges today's ethical leaders encounter.

Leadership Library contains over 250 leadership reference materials available for checkout (books, audio cassettes, videotapes, newsletters). A complete listing is available on-line, www.fis.ncsu.edu/slc. Open 8:00am to 5:00pm, Monday through Friday. Available to NC State students, faculty, and staff. FREE!!!

International Spring Break Project. Working with Habitat for Humanity Global Village, this spring break alternative challenges students to help those in need while relating what they have learned in the classroom to the outside world.

VISUAL ARTS CENTER

The arts are an essential component of a complete university education, and the Visual Arts Center provides North Carolina State University students direct and unique access to the visual arts. Since 1979, The Visual Arts Center has been responsible for the development and conservation of North Carolina State University's collection of photography, paintings, ceramics, textiles, furniture, and architectural drawings by regional and national artists.

The Visual Arts Center's two galleries are located on the second floor of the Student Center at 3302 Cates Avenue and offer a series of exhibitions, free and open to the public, featuring the best examples of regional, national, and international art. The Visual Arts Center also offers internships, educational programs and tours for North Carolina State University students.

The Administrative Offices of the Visual Arts Center are located on the third floor of the Student Center and can be reached at 919/515.3503.

FACILITIES

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 several lounge areas; 18 meeting and activity rooms, available for reservation to all campus organizations, with access to catering and audio-visual services; a television lounge; Wolves Den Game Room; a variety of dining opportunities, including The Wolves Den, Commons Cafe and Emporium Convenience Store; Center Stage at Stewart Theater. Program offices include the Chaplains' Cooperative Ministry, Student Legal Services, and University Dining administrative and catering offices. Service areas include the Reservations and Events management Offices, Information Center, and Ticket Central.

Witherspoon Student Center (WSC), located three blocks west of the main building, houses the African-American Cultural Center, Student Government Offices, the Media Authority and offices of five student-run media organizations- Technician and The Nubian Message (newspapers), Agromeck (yearbook), 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.

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

Thompson Building is the location for University Theater and The Crafts Center.

ATHLETICS

The University's "Wolfpack" athletic teams are well known nationally. The men's basketball team won national championships in 1974 and in 1983 and holds 10 Atlantic Coast Conference titles. The football team has been the Atlantic Coast Conference champion five times, co-champion twice, and has played in 21 bowl games. The Wolfpack women's cross country team won national championships in 1979 and 1980 along with 10 ACC crowns, while the men's and women's soccer teams have both advanced to the NCAA's "final four" in the last seven years. The women's basketball team, under the direction of 1988 United States Olympic gold medal winning coach Kay Yow, has played in 12 of 25 ACC Tournament title games. The wrestling team has won 12 ACC titles while the men's swim team has claimed 24 conference championships. Providing additional color and spirit for the games, the cheerleading squad was recognized 3 times as national champions. Numerous individual NC State athletes have won NCAA titles, national championships, and international honors, including medals in six Olympic Games.

INTERCOLLEGIATE ATHLETICS- GO PACK!

The Department of Athletics conducts the University's intercollegiate athletics program involving 11 varsity sports for men, 11 for women, and one co-ed. The athletics program is administered by the Athletics Director. The Council on Athletes serves in an advisory capacity to the Director of Athletics and the Chancellor. It is made up of 22 members as follows: Chair, Donn Ward, 10 members of the voting faculty, 2 members of the student body, 2 student athletes, 1 representative of the coaching staff, 2 Alumni, 2 Wolfpack Club members, 1 member of the Faculty Senate, and the Chair of the Faculty Academic Committee.

The program is self-supporting and is operated through gate receipts, radio and television revenues, and student fees. Funds for athletics grants-in-aid are provided through the North Carolina Student Aid Association (Wolfpack Club). Grants-in-aid are based upon the recommendation of the coach of each sport, approved by the Athletics Director, and awarded by the University's Financial Aid office. Men's varsity sports include soccer, cross country, and football in the fall; basketball, swimming, indoor track, and wrestling in the winter; and track, golf, tennis, and baseball in the spring. Varsity sports for women are soccer, cross-country, and volleyball in the fall; basketball, indoor track, swimming, and gymnastics in the winter; and track, golf, and tennis in the spring. During the winter the co-ed rifle team competes.

The University facilities include Carter Finley Stadium (51,500 seats); Reynolds Coliseum (12,400 seats for women's basketball, volleyball, and gymnastics); Doak Field (3,800 seats for baseball); the Paul H. Derr Track Stadium (3,000 seats) with a nine lane tartan track; a 2,200 seat swimming stadium with a 25 yard by 25 meter pool and a 50 meter training and competition pool; a soccer field (5,000 seats); and a 12 court all weather tennis complex. The men's basketball team plays their games in the 19,700 seat Entertainment and Sports Arena adjacent to Carter Finley Stadium. In addition, the Wolfpack athletics administrative offices, women's intercollegiate coaches' offices, several men's sports coaches' offices, and an athletics dining hall are housed in the Case Athletics Center. The Weisiger Brown General Athletics Facility houses the football, track, and wrestling coaches' offices, a weight room, a wrestling room, a training room, an equipment room, and dressing rooms for football, wrestling, and track. Reynolds Coliseum has a weight room, training room, and locker and dressing facilities for the women's sports and dressing rooms for the men's sports of basketball, baseball, soccer, and tennis. For ticket information call 919/515.2106 or 1.800/310.PACK.

COLLEGES, DEPARTMENTS AND PROGRAMS OF STUDY

Undergraduate programs of study are offered by the College of Agriculture and Life Sciences, the College of Design, the College of Education, the College of Engineering, the College of Natural Resources, the College of Humanities and Social Sciences, the College of Management, the College of Physical and Mathematical Sciences, and the College of Textiles.

GENERAL EDUCATION DISTRIBUTION 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 professional disciplines and fields of knowledge.

Courses meeting the General Education requirements introduce students to the disciplines of intellectual inquiry and promote respect for moral values and aesthetic experience. Students further develop an understanding of the human mind and spirit, a sense of history and the duties of citizenship, the workings of society and the world around us.

General Education in the basic fields of knowledge encourages mastery of fundamentals, versatility of mind, motivation for learning, intellectual discipline, and self-reliance. Development of these skills enables ethical and responsible participation in a democratic society.

For the most current information available, please see the following website: www.ncsu.edu/provost/academic_programs/ger.

MATHEMATICAL SCIENCES

Rationale
A logical approach to problem solving is important for successful functioning in society and should include the abilities to formulate models, be critical consumers of quantitative information, communicate mathematically, and solve problems.

The study of mathematical sciences will enable the student to:
1. Improve and refine problem-solving abilities including the ability to use the processes of mathematical modeling to bring abstract reasoning to bear on real-world problems. Students learn to formulate problems from real-world situations, move from problems to mathematical models such as graphs or equations, and transform a model into a solution.
2. Develop the ability to communicate mathematically.
   a. This includes the ability to: Follow simple directions given in prose, flow chart form, or depicted pictorially; read and interpret tables, charts, and graphs; and follow directions to conduct mathematical activity and represent the results in acceptable mathematical notation.
   b. Be able to reduce, tabulate, summarize, analyze, graphically represent, make predictions and draw inferences from presented data arising from real world situations.
3. Demonstrate logical reasoning skills including the ability to distinguish among inductive, deductive, and probabilistic reasoning and to follow, evaluate, and construct simple, logical arguments.
4. Build on previously learned algebraic and geometric concepts and models.
5. Further develop an understanding of the concept and role of functions. This includes the abilities to match functional relationships in real world contexts to mathematical representations; interpret mathematical representations of functional relationships arising in some context back to the original real world situations; and be able to translate among graphical, tabular, and symbolic representations of functions.

NATURAL SCIENCES

Rationale
The natural sciences pursue basic questions about the workings of the universe, and the richness, variety, and inter-connectedness 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 test 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.

1. Education in the natural sciences will enable the student to:
2. Use the methods and processes of science in testing hypotheses, solving problems, and making decisions.
3. Articulate and make inferences from the major concepts, principles, laws, theories, and responsible applications of science in specific disciplines;
4. Recognize the role of science in the interactions of science, technology and society; and
5. Cultivate a life-long interest in science.

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 science, technology and society courses.

WRITING AND SPEAKING

Rationale
Writing and speaking are powerful ways of understanding ourselves and the world we live in. It is through writing and speaking that the various disciplines and professions define the knowledge and methodologies that characterize them. Because these communication arts are central to learning and to engaging in the productive life of a community, students must:
1. learn to use writing and speaking as ways of generating, critiquing, and refining ideas, both their own and those of others;
2. understand and use the conventions and standards governing written and spoken disclosure across academic disciplines;
3. develop the critical reading, writing, and speaking abilities necessary for participating effectively in a discipline;
4. develop a repertoire of strategies for addressing the concerns of audiences in the many contexts of contemporary life-academic, professional, and civic.

Minimum Requirements in Writing and Speaking for all Curricula (7 hours)
1. One semester of composition and rhetoric during the freshman year.
2. One semester from any of the following:
   a. advanced writing
   b. speech
   c. foreign language (FL 201 or higher in the students first foreign language course in a second language)

In addition, each curriculum is designed so that upper-level courses and other programmatic experiences help students write and speak competently in 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 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 discipline 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.

The goal of general education in the humanities and social sciences is to give the students the foundations for an understanding of:
1. the cultural and linguistic traditions of their own and other societies,
2. the past and action of historical processes
3. the application of scientific methods to the study of human behavior and mental processes, both individual and collective,
4. ethical choices and the issues of human values they entail, and how to make those choices with intellectual rigor and clarity,
5. the aesthetic, personal, and cultural significance of works or art and,
6. various disciplines as modes of inquiry with distinctive purposes and intellectual processes; and the ability to:
   a. distinguish degrees of plausibility and verification, by critically examining both evidence and logic
   b. read analytically (i.e., to reconstruct arguments and consider implications) and interpretatively (i.e. to grasp meaning by being sensitive to the ways in which meaning is generated), as well as to acquire information.

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 or the equivalent in the study of literature (3 hours).
2. One course or the equivalent in the study of philosophy, religion, or history (3 hours).
3. One course or the equivalent in the study of visual and performing arts (3 hours). This requirement may alternatively be fulfilled by taking a course in history.
4. Two courses or the equivalent from different content areas, in the study of psychology, economics, politics and government, sociology, anthropology, and cultural geography (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.
6. Among the courses selected to fulfill the Humanities and Social Sciences requirement at last 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
1. Two years of high school foreign language are required as a prerequisite for admission to the University.
2. Foreign language proficiency at the FL 102 level is required for graduation.

PHYSICAL EDUCATION

Rationale
Essential to a university student's development are attitudes and skills for healthy lifestyles. In addition to maintaining fitness, participation in team and individual physical activity significantly reduces major health risks.

Goals for students in physical education include:
1. learning the fundamentals of cardiovascular and strength development and applying this knowledge in the initiation and/or continuation of personal fitness programs,
2. acquiring the basic skills of several lifetime sports or activities and enhancing their proficiency in these skills so that they will continue to participate throughout life,
3. gaining a working knowledge of the rules, strategies, and safety aspects of several sports or activities,
4. reducing stress from the academic rigors of their other courses, and improving their general physical, social, and mental well being while learning, participating, and having fun.

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.
2. All courses will be available on a/an S/U basis.

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.

Goals for students in completing the Science, Technology and Society requirement include:
1. developing an understanding of the influence of science and technology on civilizations,
2. developing the ability to respond critically to scientific and technological issues in civic affairs, and
3. understanding the interactions among science, technology and values.

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.

COMMUNICATION AND INFORMATION TECHNOLOGY

COMPUTER LITERACY

Today's graduate must have a knowledge of information technology and computer applications. Every student needs a basic understanding of information processing. It is not necessary that every student be a programmer.

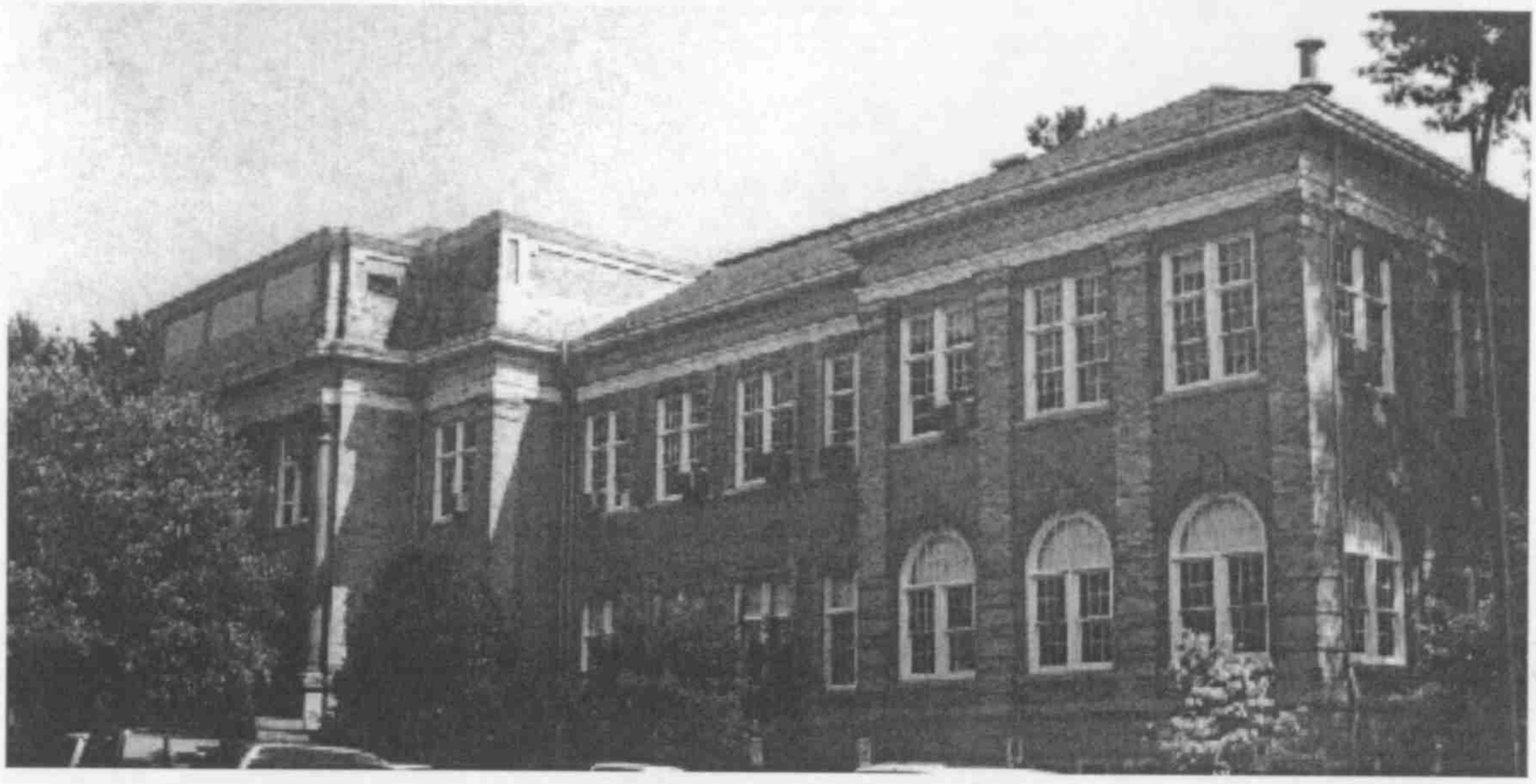
Students should develop and demonstrate proficiency in the use of computers, learning to use applications such as word processing, spreadsheets, database management programs, electronic mail, and packages and applications specific to their field of study.
Library/Information Literacy
The demands of an increasingly technological and information-dependent society require that students have a basic understanding of how information is identified and defined by experts, structured, physically organized, and accessed.

Proficiency is best gained by requiring the use of information resources to complete an assignment, or to create a bibliography from which a paper or speech is developed. Information retrieval instruction beyond that provided in freshman English could be connected with writing and speaking requirements and/or it could be taught by requiring assignments involving substantial use of library resources. Academic units are encouraged to work closely with library staff for the development and delivery of instruction and experience in information retrieval techniques.

Minimum Requirements in Communication and Information Technology for all Curricula
The following may be used to fulfill computer technology instructions:
1. instruction and assignments required within courses, and/or
2. required use of a computer to complete assignments

The following may be used to fulfill information retrieval instruction:
1. use of one or more class periods to teach the structure of information, and to provide experience using major information resources,
2. use of self-paced printed instructional materials,
3. use of computer-based instructional materials,
4. development of an information-based assignment requiring use of library resources, and/or other methods as appropriate for the discipline.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES



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B. M. Kirby, *Assistant Director, Academic Programs*
B. P. Alston-Mills, *Coordinator, CALS Diversity Programs*

College of Agriculture and Life Sciences

Academic programs in the college represent a unique blending of the agricultural 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 of one of the curriculum in this college.
- The degrees of Master of Science, Master of Agriculture and Master of Life Sciences are offered in the various departments in the college.
- The Doctor of Philosophy degree is offered in the following subject areas: animal science, biochemistry, bio-informatics, biological and agricultural engineering, botany, crop science, economics, entomology, food science, genetics, horticultural science, immunology, microbiology, nutrition, physiology, 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 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-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, animal science, agricultural and extension education, applied sociology, biochemistry, biological engineering (joint program with the College of Engineering), biological sciences, botany, fisheries and wildlife sciences (joint program with the College of Natural Resources) food science, horticultural science, microbiology, poultry science, and zoology. Pre-professional courses are offered in the science curriculum track. Technology agricultural and environmental technology, animal science, food science, horticultural science and poultry science.

FRESHMAN YEAR

The curricula in the College of Agriculture and Life Sciences have a common freshman year with the exception of the science 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
Agriculture Business Management	Agricultural and Resource Economics
Agricultural & Environmental Technology	Biological and Agricultural Engineering
Animal Science	Animal Science
Applied Sociology	Sociology and Anthropology
Biological Sciences	Biological Sciences
Biotechnology	Biological Sciences
Botany	Botany
Entomology	Entomology
Crop Science	Crop Science
Food Science	Food Science

Genetics
Horticultural Science
Microbiology
Nutrition
Poultry Science
Soil Science
Zoology

Genetics
Horticultural Science
Microbiology
Food Science
Poultry Science
Soil Science
Zoology

INTERDEPARTMENTAL AND INTERDISCIPLINARY PROGRAMS

These curricula offer the opportunity to select broad curriculum majors that involve two or more departments or colleges:

Agronomy- a technical curriculum dealing with the fundamentals of crop production and soil management. The curriculum is administered by the Departments of Crop Science and Soil Science

Biological Sciences- a curriculum with emphasis on biological and physical sciences, especially designed for graduate or professional courses requiring a biology background.

Environmental Sciences- a curriculum concerned with the development of new and more efficient ways to maintain and enhance the world's environments for society's benefit including ecological, technical and economic approaches. The curriculum is administered jointly by the College of Agriculture and Life Sciences and the College of Physical and Mathematical Sciences.

Natural Resources- a curriculum concentrating on the use, management, and improvement of natural resources. The curriculum is administered jointly by the College of Agriculture and Life Sciences, the College of Natural Resources, and the College of Physical and Mathematical Sciences.

In addition to these cited curricula, a number of arrangements are available that provide the student an opportunity to select areas of course concentration.

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 Honor 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 honors course work (at least 3 credit hours outside CALS) or participate in the University Scholars Program for at least two semesters. 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, 102, 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 earn at least three credit hours in biochemical-related research. A written scientific report based on the student's research is required. A minimum of 9 credit hours must be drawn from at least two of the following three categories:

- designated Honors courses, such as BCH 454H
- advanced courses, such as 500-level courses in related fields
- research, such as BCH 492, BCH 493, or ALS 498H and 499H

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 350 scholarships each year on a combination of selection factors including merit, financial need, and leadership.

Jefferson Scholars in Agriculture/Life Sciences and the Humanities (*See College of Humanities and Social Sciences*)
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 double degree that permits participants to have two concentrations: one in an area of agriculture/life sciences and one in an area of humanities/social sciences. The double degree program may be individually designed 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. Each spring a number of entering freshmen are chose to receive scholarships to participate in the Jefferson Program. In addition, other qualified students may choose to pursue a double major in agriculture/life sciences and the humanities under the Jefferson Program.

Students interested in applying to the Jefferson Scholars program should contact either of the following people before January 15.

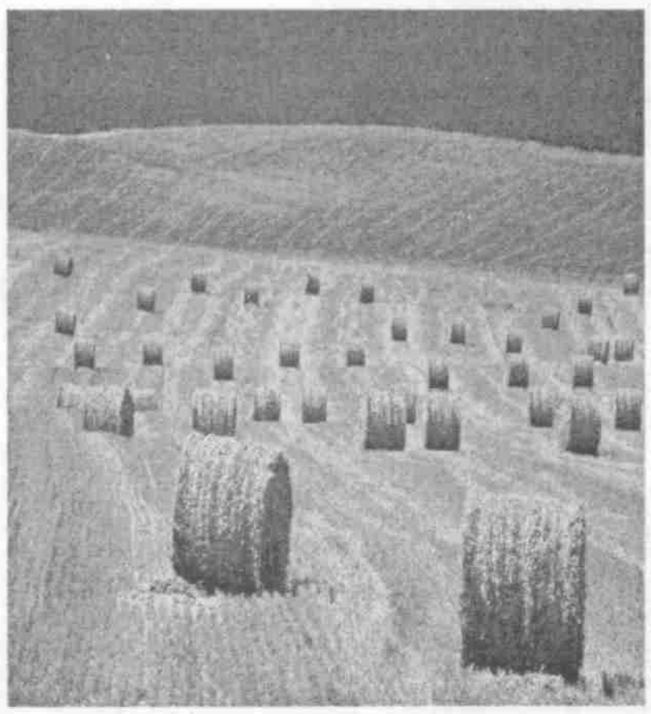
Dr. Kenneth L. Esbenshade
College of Agriculture and Life Sciences
NCSU Box 7642, Raleigh, NC 27695
Phone: 919/515.2614

Dr. Randy Thomson, Associate Dean
College of Humanities and Social Sciences
NCSU Box 8101, Raleigh, NC 27695
Phone: 919/515.2467

DEPARTMENT OF AGRICULTURAL AND EXTENSION EDUCATION

Ricks Hall, Room 216
Phone: 919/515.2207
www.cals/ncsu.edu/agexed

J. L. Flowers, *Head and Coordinator of Advising*



Professors: G.W. Bostick, G.E. Moore, R.D. Mustian, R.W. Shearon; *Assistant Professors*: D.B. Croom, E.B. Wilson; *Extension Specialists-Educational Programs*: J.G. Richardson; *Extension Associates*: J. Bledsoe, B. Forrest, D. Harris, H. Johnson, R.M. Stewart; *Associate Faculty*: J. Groff, D.M. Jenkins, R.C. King, R.T. Liles, T.T. McKinney, M. Owen; *Adjunct Faculty*: M. Baker, D. Boone, E.J. Boone, 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.

Numerous professional improvement opportunities area 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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/agexttco.htm

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.

Specific curriculum requirements are available at the following address:
Extension Education/Extension Concentration, Bachelor of Science in Extension Education
www.ncsu.edu/reg_records/ug_catalog/programs/cals/agexteducurr.htm
Extension Education/Extension Concentration, Bachelor of Science in Agricultural Education
www.ncsu.edu/reg_records/ug_catalog/programs/cals/agextaxc.htm

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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/agextcc.htm

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

Nelson Hall, Room 232
Phone: 919/515.3107
www.ag-econ.ncsu.edu

J. A. Brandt, *Head*
C. L. Moore, *Associate Head and Extension Leader*
A. W. Otmans, *Coordinator of Undergraduate Programs*

William Neal Reynolds Professor: M.K. Wohlgenant; *Professors*: J.A. Brandt, A.B. Brown, G.A. Carlson, L.E. Danielson, J.E. Easley, E.A. Estes, T.J. Grennes, M.T. Holt, M.C. Marra, C.L. Moore, C.D. Safley, V.K. Smith, W.N. Thurman, T. Vukina, M.L. Walden, M.K. Wohlgenant; *Adjunct Professor*: J.B. Hunt, Jr.; *Professors Emeriti*: R.C. Brooks, A.J. Coutu, D.G. Harwood, Jr., D.M. Hoover, L.A. Ihnen, R.A. King, H.L. Liner, T.E. Nichols, Jr., D.F. Neuman, 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.W. Oltmans, M.A. Renkow, G.A. Wossink, K.D. Zering; *Associate Professors Emeritus*: J.G. Algood, R.S Boals, H.C. Gilliam, Jr., D.D. Robinson, P.S. Stone; *Assistant Professors*: F. Ciliberto, D.G. Hallstrom, A. Inoue, R.L. Lamb, D.J. Phaneuf, N.E. Piggott; *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.H. Kirchk, J.M. Kuszaj, M. Wohlgenant; *Extension Specialists*: S.G. Bullen, T.A. Feitshans, G. van der Hoven, L.S. Smutko, R.H. Usry.

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 a 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 to 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 at the following address:
Curriculum in Agricultural Business Management, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsagbm.htm
Curriculum in Agricultural Business Management, Biological Sciences Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsagbs.htm

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.

CURRICULA IN AGRONOMY

Williams Hall

J. Thomas Stalker, *Head of the Department of Crop Science*
J. L. Havlin, *Head of the Department of Soil Science, Director of Graduate Programs, Soil Science*
R.P. Patterson, *Undergraduate Coordinator, Crop Science*
H. J. Kleiss, *Undergraduate Coordinator, Soil Science*
D. Danehower, *Director of Graduate Programs, Crop 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 agronomy curriculum is administered jointly by the Departments of Crop Science and Soil Science. 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.

CURRICULA

Specific curriculum requirements are available at the following addresses:

Curriculum in Agronomy, Agronomic Sciences Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsargasc/htm
Curriculum in Agronomy, Agronomic Business Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsargabc.htm
Curriculum in Agronomy, Crop Production Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsargcpc.htm
Curriculum in Agronomy, Soil Science Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsargssc.htm
Curriculum in Agronomy, Turfgrass Management Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsargtmc.htm

DEPARTMENT OF ANIMAL SCIENCE

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

R. L. McCraw, *Interim Head*

Alumni Distinguished Professors: S.L. Ash, W.L. Flowers; *William Neal Reynolds Professor*: E.J. Eisen; *Alumni Distinguished Professors Serving as Administrators*: J.C. Cornwell, K.L. Esbenshade; Professors: B.P. Alston-Mills, J.H. Eisemann, R.L. McCraw, R.A. Mowrey, Jr., J. Odle, R.M.Petters, O.W. Robison, J.W. Spears, S.P. Washburn, L.W. Whitlow; *Professors Serving as Administrators*: L.S. Bull, R.G. Crickenberger; *Adjunct Professor*: S.D. Perreault (Environmental Protection Agency); *Professors Emeriti*: A.V. Allen, T.C. Blalock, D.G. Braund, K.R. Butcher, E.B. Caruolo, D.G. Davenport, R.W. Harvey, W.L. Johnson, E.E. Jones, J.R. Jones, F.N. Knott, C.A. Lassiter, J.M. Leatherwood, J.G. Lecce, B.T. McDaniel, R.D. Mochrie, R.M. Myers, G.S. Parsons, J.W. Patterson, B.R. Poulton, A.H. Rakes, H.A. Ramsey, F.D. Sargent, F.H. Smith, J.C. Wilk, G.H. Wise, J.R. Woodard; *Associate Professors*: C.E. Farin, B.A. Hopkins , R.E. Lichtenwalner, J.M. Luginbuhl, W.E.M. Morrow, M.H. Poore, M.T. See, C.M. Williams; *Associate Professors Emeriti*: E.U. Dillard, J.J. McNeil; *Assistant Professors*: S.L. Ash, J.P. Cassady, V. Fellner, R.J. Harrell, M.E. Hockett, G.B. Huntington, J.A. Moore, E. van Heugten, T.A. van Kempen, C.S. Whisnant; Lecturer: J.L. Sandberg; *Visiting Lecturer*: K.D. Ange; *Extension Specialists*: J.S. Clay, P.A. Dukas, G.R. Griffin, D.C. Miller, D.E. Pritchard, 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 (Farm Animal Health and Resource Management, CVM), 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 (Farm Animal Health and Resource Management, 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. All activities with live animals are approved by the Institutional Animal Care and Use Committee (IACUC). 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 pre-professional 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 at the following address:

Industry Curriculum in Animal Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/inanimal.htm

Science Curriculum in Animal Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/scanimal.htm

MINOR IN ANIMAL SCIENCE

A minor in Animal Science is open to all interested baccalaureate students. 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 8 hours in required courses and 7 hours in 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 MOLECULAR AND STRUCTURAL BIOCHEMISTRY

Polk Hall, Room 128
Phone: 919/515.2581

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

William Neal Reynolds Professor: W.L. Miller; *Professors*: P.F. Agris, L.K. Hanley-Bowdoin, 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, C.L. Hemenway, 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.

HONOR AND 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 the two semester 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.

CURRICULUM

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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsbiochm.htm

DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING

David S. Weaver Laboratories, Room 100
Phone: 919/515.2694
www.bae.ncsu.edu

James H. Young, *Head*
R. O. Evans, Jr., *Department of Extension Leader*
D. H. Willis, *Director of Graduate Programs*
C. G. Bowers, Jr., *Undergraduate Coordinator*

Distinguished University Professor and William Neal Reynolds Professor: R.W. Skaggs; *Professors*: C.G. Abrams, Jr., D.B. Beasley, S.M. Blanchard, C.J. Bowers, Jr., M.D. Boyette, F.J. Humenik, G.D. Jennings, T.M. Losordo, J.E. Parsens, R.P Rohorbach, A.R. Rubin, R.S. Sowell, L.F. Stikeleather, P.W. Westerman, T.B. Whitaker (USDA), D.H. Willis, J.H. Young; *Adjunct Professors*: L.M. Safely, Jr., S.S. Schiffman, L.F. Sykes; *Professors Emeriti*: J.C. Barker, G.B. Blum, Jr., J.W. Dickens, L.B. Driggers, J.M. Fore, G.W. Giles, E.G. Humphries, W.H. Johnson, G.J. Kriz, W.F. McClure, F.M. Richardson, R.E. Sneed, C.W. Suggs, R.W. Watkins, E.H. Wiser; *Associate Professors*: G.R. Baughman, J.J. Classen, R.O. Evans, Jr., S.A. Hale, R.L. Huffman, G.T. Roberson; *Research Associate Professors*: S.K. Lehir; *Extension Associate Professors*: J. Spooner; *Assistant Professors*: J. Cheng, M.S. Chinn, P.L. Mente, R.R. Sharma; *Research Assistant Professors*: G.M. Chescheir; *Assistant Professor*: G.L. Grabow; *Adjunct Assistant Professors*: D.D. Archibald, R.L. Langley, S.K. Seymour; *Extension Specialists*: W.F. Hunt, D.E. Line, J.M. Rice, R.L. Sherman; *Associate Members of the Faculty*: C.R. Daubert (Food Science), B.E. Farkas (Food Science), A.E. Hassan (Forestry), K.M. Keener (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 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 conser-

vation 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 "BS 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/agenvtec.htm

The program educational objectives of the Biological Engineering (BE) Bachelor of Science (BS) 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 (BS) 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.

CURRICULUM IN BIOLOGICAL SCIENCES

Bostian Hall, Room 2717

W. C. Grant, *Undergraduate Coordinator*

Professors: W.C. Grant (Zoology), R.P. Patterson (Crop Science), E. Davis (Botany); *Associate Professors*: R.L. Beckmann, Jr. (Botany), M. Niedzlek-Feaver (Zoology), B.C. Haning (Plant Pathology), J.E. Mickle (Botany); *Faculty Lecturer*: L.D. Parks (Zoology); *Laboratory Supervisor*: P.M. Aune (Botany); *Laboratory Manager*: T.B. Johansson (Biological Sciences); *Teaching Technician*: W.P. Crumpler (Microbiology).

The Biological Sciences constitute a rapidly developing field offering many challenging and rewarding opportunities for well-trained students. The Biological Sciences Interdepartmental Program offers a B.S. Degree in Biological Sciences for students seeking comprehensive training in biology and the supporting sciences.

Many graduates of this program continue further studies in graduate schools in such diverse fields as botany, zoology, marine biology, physiology, genetics, biochemistry, biotechnology, pharmacology, and microbiology. Others attend professional schools in medicine, optometry, and veterinary medicine as well as other health-related fields.

The Biological Sciences curriculum provides a modern, flexible, undergraduate program to prepare students for rewarding careers in research and teaching as well as in business, industry, research institutes, and governmental agencies. A wide range of career opportunities are available in technical sales, manufacturing and quality control, environmental management, and other positions with pharmaceutical companies, food manufacturers, medical laboratories, public utilities, and other industries. A joint program with the Department of Mathematics and Science Education leads to a double major and a teaching certificate.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/cubiosci.htm

MINOR IN BIOLOGICAL SCIENCES

The minor in Biological Sciences is open to all interested baccalaureate students with the exception of Zoology and Botany majors, but is intended primarily to enhance the programs of students whose major field is outside the Biological Sciences area. Students pursuing a minor in Biological Sciences will become familiar with fundamental principles of biology and gain a broad-based perspective of the biological sciences. The minor requires a minimum of 17 credit hours. The minor program is flexible so that students may take courses in areas of individual interest.

DEPARTMENT OF BOTANY

Gardner Hall, Room 2214
Phone: 919/515.2727

M. E. Daub, *Head*
C. G. VanDyke, *Coordinator*
N. S. Allen, *Director of Graduate Programs*

University Research Professor: W.F. Thompson; *Alumni Distinguished Undergraduate Professors*: R.L. Beckmann, C.G. VanDyke; *Professors*: N.S. Allen, U. Blum, W.F. Boss, R.S. Boston, J.M. Burkholder, W.S. Chilton, E. Davies, R.C. Fites, H.E. Pattee (USDA), J.F. Thomas, C.G. VanDyke, T.R. Wentworth; *Professors Emeriti*: C.E. Anderson, R.J. Downs, J.W. Hardin, W.W. Heck (USDA), R.L. Mott, G.R. Noggle, E.D. Seneca, J.R. Troyer; *Associate Professors*: R.L. Beckmann, J.E. Mickle, D. Robertson, J.M. Stucky; *Assistant Professor*: D. Robertson, J. Xiang; *Teaching Technician*: D.S. Wright; *Associate Members of the Faculty*: H.V. Amerson (Forestry), K.O. Burkey (USDA), M.M. Goodman (Crop Science, Statistics, Genetics), S.C. Huber (USDA), M.D. Purugganan (Genetics), T.W. Rufty, Jr., (Crop Science), E.C. Sisler (Biochemistry), E.A. Wheeler (Wood and Paper Science), R.W. Whetten (Forestry); Adjunct Associate Professor: C.S.Brown, G.K. Muday.

The instructional program provides classroom, laboratory, and field experience in the major areas of plant science. Undergraduates majoring in botany are given a broad background in the humanities and physical sciences and are encouraged to participate in independent study in the senior year. Majors, as pre-professionals in the plant sciences, are prepared for advanced study in botany 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 pre-professional 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.

CURRICULUM

The Bachelor of Science degree with a major in Botany 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 botany- 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsbotany.htm

MINOR IN BIOTECHNOLOGY

The Minor in Biotechnology is designed to provide a first hand experience with a variety of technologies that use gene manipulation. The laboratory courses should be started in the sophomore or junior year, following completion of BIO 181 or ZO 160 and Organic Chemistry (CH 223) with a grade of C- or better. The Core Technologies course, BIT 360, is required for all students, but MB 409, ZO 480, or BCH 454 can be substituted. Other requirements for the minor include a 3 credit research internship, 4 credits of advanced biotechnology laboratory courses (BIT 461-468), and a 3 credit ethics course. Interested students should contact Dr. John Chisnell in the Biotechnology Program Office, 216 Scott Hall, biotech@ncsu.edu, for information and application materials.

DEPARTMENT OF CROP SCIENCE

Williams Hall, Room 2205
Phone: 919/515.2647

H. T. Stalker, *Head*
J. F. Spears, *Department Extension Leader*
R. P. Patterson, *Undergraduate Coordinator*
D. A. Danehower, *Director of Graduate Programs*

Distinguished University Professor: M.M. Goodman; *Alumni Distinguished Undergraduate Professor*: R.P. Patterson; *William Neal Reynolds Professors*: M.M. Goodman, E.A. Wernsman; *Philip Morris Professor*: G.F. Peedin; *Professors*: J.R. Anderson, D.T. Bowman, A.H. Bruneau, J.C. Burns (USDA), J.W. Burton (USDA), B.E. Caldwell, T.E. Carter, Jr. (USDA), F.T. Corbin, E.J. Dunphy, E.L. Fiscus (USDA), D.S. Fisher (USDA), J.T. Green, Jr., S.C. Huber (USDA), R.E. Jarrett, D.A. Knauft, H.M. Linker, R.C. Long, J.E. Miller (USDA), J.P. Mueller, J.P. Murphy, C.H. Peacock, R.C. Rufty, W.D. Smith, H.T. Stalker, J.B. Weber, W.W. Weeks, R. Wells, G.G. Wilkerson, R.F. Wilson (USDA), J.C. Wynne, A.C. York; *Adjunct Professors*: J.R. Evans, K.D. Getsinger, D.G. Oblinger, D.T. Patterson, J.A. Ryals, G.M. Werner; *Professors Emeriti*: R.R. Bennett, C.T. Blake, C.A. Brim, D.S. Chamblee, J.F. Chaplin, H.D. Coble, W.K. Collins, W.A. Cope, S.H. Dobson, D.A. Emery, W.T. Fike, D.U. Gerstel, W.B. Gilbert, W.C. Gregory, H.D. Gross, G.R. Gwynn, P.H. Harvey, S.N. Hawks, G.L. Jones, G.C. Klingman, J.A. Lee, W.H. Lewis, R.L. Lovvorn, R.P. Moore, D.E. Moreland, A. Perry, L.L. Phillips, J.C. Rice, H. Seltman, G.A. Sullivan, D.L. Thompson, D.H. Timothy, J.A. Weybrew, A.D. Worsham; *Associate Professors*: D.C. Bowman, K.O. Burkey (USDA), R.J. Cooper, D.A. Danehower, R.E. Dewey, K.L. Edmisten, G.P. Fenner, T.G. Isleib, S.H. Kay, R.D. Keys, P. Kwanyuen (USDA), D.P. Livingston (USDA), P.H. Sisco (USDA), V.A. Sisson, J.F. Spears, A.K. Weissinger, R. Wells, J. Wilcot; *Associate Professors Emeriti*: R.L. Davis, W.G. Toomey; *Assistant Professors*: R.W. Heiniger, D. Jordan, J.M. Luginbuhl, R. Qu, P.R. Weisz, F.H. Yelverton; *Adjunct Assistant Professor*: M. Fraser; *Extension Specialists*: D.W. Daniel, C.M. Sasser; *Crop Science Specialists*: S.C. Bennett, C.E. Collins, G.E. Martin; *Associate Members of the Faculty*: R.L. Beckmann (Biological Sciences), M. Feaver (Zoology), W. Grant (Zoology), B. Haing (Biological Sciences), J. Mickle (Biological Sciences), L. Parks (Lecturer), C.W. Stuber (Genetics), W.F. Thomson, C.T. Young (Food Science); *Visiting Professor*: T.W. Rufty, Jr.

Crop Scientists seek to improve the productivity, profitability, and quality of our major food, feed, fiber, and specialty crops; enhance the quality of turf and vegetative cover, enhance our environment, and improve the nutrition and economic health of our world. The Crop Science four-year undergraduate program is offered within the Agronomy curriculum and is administered jointly by the Crop Science and Soil Science Departments. Students may earn a Bachelor of Science degree in the technology curriculum with a major in Agronomy (See Agronomy Curriculum).

OPPORTUNITIES

Agronomy major graduates find employment as consultants, extension agents, farm managers, golf course superintendents, landscape specialists, research scientists, seed production specialists, sod production specialists, soil survey specialists, soil conservationists, technical sales representatives, and waste management specialists. Graduate work can lead to careers in plant breeding, biotechnology, crop physiology and chemistry, and crop management systems. (For Crop Science graduate programs, see the *Graduate Catalog*).

CURRICULA

Students may earn a Bachelor of Science degree in the technology curriculum with a major in Agronomy. The Agronomy option is administered jointly by the Departments of Crop Science and Soil Science.

CURRICULUM IN DAIRY SCIENCE

(See Animal Science)

MINOR IN CROP SCIENCE

Open to any undergraduate degree 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

DEPARTMENT OF ENTOMOLOGY

Gardner Hall, Room 2301
Phone: 919/515.2746

J. D. Harper, *Head*
J. R. Meyer, *Undergraduate Coordinator*
D. B. Orr, *Director of Graduate Programs*
P. S. Southern, *Department Extension Leader*

Phillip Morris Professor: P.S. Souther, J.W. Van Duyn; *William Neal Reynolds Professor*: 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, C.S. Apperson, J.S. Bacheler, J.R. Bradley, Jr., R.L. Brandenberg, L.L. Deitz, F.P. Hain, J.D. Harper, J.R. Meyer, B.M. Parker, K.A. Sorensen, R.E. Stinner, J.F. Walgenbach; *Adjunct Professors*: G. Gordh, D.M. Jackson, P.M. Marsh, D.E. Sonenshine; *Professors Emeriti*: R.C. Axtell, M.E. Barbercheck, J.R. Baker, W.M. Brooks, W.V. Campbell, M.H. Farrier, R.J. Kuhr, H.B. Moore, Jr., H.H. Neunzig, R.L. Rabb, R.L. Robertson, C.G. Wright; *Associate Professors*: D.B. Orr, C.E. Sorenson, B.M. Wiegmann; *Adjunct Assistant Professors*: D.E. Herbert, C. Nalepa; *Associate Professor Emeritus*: R.C. Hillman; *Assistant Professors*: C.A. Casey, E.L. Vargo, D.W. Watson; *Adjunct Associate Professors*: A.K. Dowdy, K.R. Lakin, R. Sequiera, J.W. Smith, M.D. Tomalski; *Visiting Assistant Professor*: M.G. Waldvogel; *Extension Specialists*: S.B. Bambara, D.L. Stephan, S.M. Stringham, S.J. Toth, M.G. Waldvogel; *Associate Members of the Department*: *Professors*: R.B. Leidy (Toxicology), H.M. Linker (Crop Science); *Assistant Professors*: W.G. Buhler (Horticulture), D.J. Robison (Forestry), R. Rose (Toxicology).

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 courses fulfill General Education Requirements in Natural Sciences or Science and Technology and serve students majoring in biological sciences, agronomy, botany, horticultural science, agricultural education, crop science, and forestry. 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.

CURRICULUM

There is no entomology undergraduate major. Those students with a primary interest in entomology are advised to choose a general biological sciences 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
www.tox.ncsu.edu

D. Shea, *Head and Director of Graduate Programs*
C. S. Hofelt, *Undergraduate Program Coordinator*

William Neal Reynolds Professor (emeritus): E. Hodgson; *Professors*: G.A. LeBlanc, R.C. Smart; *Adjunct Professors*: J.A. Bond, A.M. Cummings, A.B. DeAngelo, J.A. Goldstein, L.E. Gray, W.F. Greenlee, K.S. Korach, R.J. Langenbach, R.O. McClellan, R.J. Preston, D.C. Zeldin; *Professors Emeriti*: T.J. Sheets, R.B. Leidy; *Associate Professors*: S. Branch, D. Shea; *Adjunct Associate Professors*: A.E. Chalmers, N. Chernoff, K.M. Crofton, H.B. Matthews, Jr., B.A. Merrick, R.T. Miller, L. Recio; *Assistant Professors*: W.G. Cope, M.F. Oleksiak, J. Tsuji, Y. Tsuji, A.D. Wallace; *Visiting Assistant Professors*: C.S. Hofelt, R.L. Rose; *Adjunct Assistant Professor*: D.J. Dix; *Associate Members of the Program: Professors*: K.B. Adler, J.E. Riviere, R.M. Roe, J.M. Cullen, H.M. Hassan, R.J. Kuhr, W.H. McKenzie, N.A. Monteiro-Riviere, M.A. Qureshi, P.L. Sannes, I.W. Smoak, M.K. Stoskopf; *Associate Professor*: J.M. Law; *Research Assistant Professor*: J.M. Horowitz; *Assistant Professors*: R.E. Baynes, M. Hyman.

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.

CURRICULUM

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.

CURRICULUM IN ENVIRONMENTAL SCIENCES

(Also see Interdisciplinary Programs or Physical and Mathematical Sciences)
Nelson Hall, Room 2332; Williams Hall, Room 2321; North Gardner Hall, Room 3216

A. W. Oltmans, *Coordinator, Economic Policy Concentration (Nelson Hall, Room 233E)*
H. J. Kleiss, *Coordinator, Environmental Soil Science Concentration (Williams Hall, Room 2321)*
S.C. Mozley, *Coordinator, Ecology Concentration (Gardner Hall, Room 2104)*

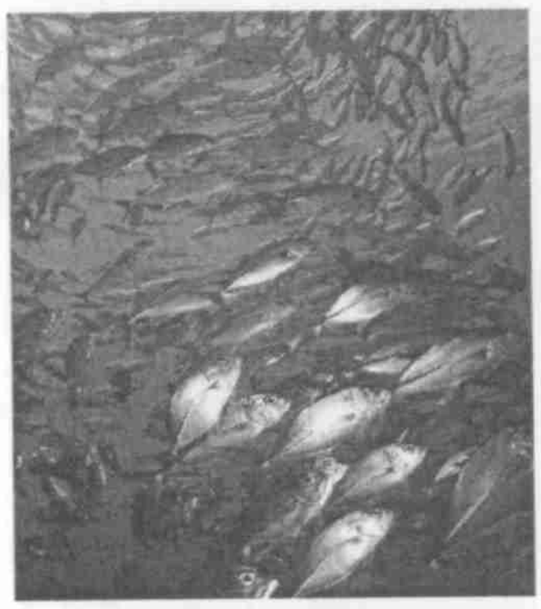
Environmental sciences, in the broadest sense, are concerned with the development of basic knowledge about the world's environments and the use of this knowledge to create new and more efficient ways to maintain or enhance the environment for society's benefit. Given the complexity of environmental processes 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 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, Economics Policy and Environmental Soil Science (see Department of Entomology). For information on other concentrations, see the Department of Marine, Earth, and Atmospheric Sciences and the Department of Statistics within the College of Physical and Mathematical Sciences.

Specific curriculum requirements are available at the following address:
Curriculum in Environmental Sciences, Ecology Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsenvsciecoc.html
Curriculum in Environmental Sciences, Economic Policy Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsenvepc.htm
Curriculum in Environmental Sciences, Soil Science Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/encsciss.htm



PROGRAM IN FISHERIES AND WILDLIFE SCIENCES

Turner House, 110 Brooks Avenue

R. A. Lancia, *Undergraduate Coordinator*
The Departments of Forestry and Zoology share the program in Fisheries and Wildlife Sciences. Undergraduate education emphasizes ecological principles and their application to research problems and natural resource management needs. Majors are well prepared for graduate work and entry-level professional positions.

Specific curriculum requirements are available at the following address:
Curriculum in Fisheries and Wildlife Sciences, Concentration in Fisheries Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsfish.htm
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bswild.htm

DEPARTMENT OF FOOD SCIENCE

Schaub Hall, Room 100
Phone: 919/515.2951

K. R. Swartzel, *Head*
D. R. Ward, *Associate Department Head and Department Extension Leader*
P. M. Foegeding, *Undergraduate Teaching Coordinator*
D. K. Larick, *Graduate Administrator*

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., A.P. Hansen, T.C. Lanier, D.K. Larick, R.F. McFeeters (USDA), J.L. Oblinger, J.E. Rushing, T.H. Sanders (USDA), L.G. Turner, D.R. Ward; *Associate Professors*: C.R. Daubert, B.E. Farkas, D.P. Green, L.A. Jaykus, S. Kathariou, K.M. Keener; *Assistant Professors*: F. Breidt (USDA), M.A. Drake, D.J. Hanson, K.P. Sandeep; *Research Assistant Professor*: J. Simunovic; *Professors Emeriti*: L.W. Aurand, H.R. Ball, T.A. Bell, R.E. Carawan, J.A. Christian, E.S. Cofer, H.B. Craig, H.P. Fleming, M.E. Gregory, M.W. Hoover, I.D. Jones, V.A. Jones, N.C. Miller Jr., D.H. Pilkington, A.E. Purcell, W.M. Roberts, 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 Science), 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), H.E. Pattee (Botany), B.W. Sheldon (Poultry Science); *Adjunct Professors*: P.A. Curtis, J.M. Drozd, R.C. Theuer, N.B. Webb.

The Department of Food Science provides undergraduate and graduate programs for the application and integration of chemistry, biology, and engineering to the development, processing, packaging, quality control, distribution, and utilization of safe and nutritious foods. The Food Science Bachelor of Science program is compatible with pre-professional school curricula; many students elect to double major in Food Science with Biochemistry, Chemical Engineering, Poultry Science or other curricula. Minors in a variety of areas are also encouraged. The department maintains modern, fully-equipped laboratories for teaching and research in the disciplines of food microbiology, food chemistry/biochemistry, food engineering, and nutrition; and the product areas of dairy, fruit, meats, poultry, seafood, and vegetable products. Departmental programs address food safety, value-added food processing, environmental impact of food processing, and nutritional health. Food Science includes the most current information related to biotechnology, engineering approaches, and computer applications as they relate to providing safe foods with minimal impact on the environment.

OPPORTUNITIES

Increasing consumer concern regarding food safety and demands for greater varieties of nutritious and convenient foods of uniformly high quality creates many varied career opportunities in the food, pharmaceutical and allied industries. Career opportunities in food industries include management, research and development, process supervision, quality control, procurement, distribution, and sales merchandising. Positions include sales and service in allied industries, consulting and trade association activities, and

promotional and educational services. Food Science graduates hold teaching, research and extension positions with colleges and universities. Governmental agencies employ food scientists whose work is directed toward research, regulatory control, and the development of food standards.

The food industry provides both merit and financial need scholarships to encourage students preparing for careers in Food Science. Phi Tau Sigma invites outstanding seniors to membership, and all students are encouraged to participate in the Food Science Club, a student branch of the Institute of Food Technologists.

CURRICULA

The Bachelor of Science degree with a major in Food Science is offered through curricula with a science emphasis or a technology emphasis. The science program is designed for students with interest in graduate school or for those desiring more rigorous science courses for technical careers in the food industry. Students more interested in business opportunities for technically trained individuals find that the technology program permits greater flexibility in complementing Food Science coursework with business, agricultural commodity and computer science courses.

Specific curriculum requirements are available at the following addresses:

Science Curriculum in Food Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/scifood.htm
Technology Curriculum in Food Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/tecfood.htm

MINOR IN FOOD SCIENCE

The Food Science Minor is designed to provide students with important food science principles and concepts. It should give a competitive edge to individuals seeking employment in the food, pharmaceutical and related industries as a chemist, microbiologist, engineer, nutritionist, business specialist or technical writer. A minor will provide 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 at the 200, 300, and 400 level may be selected to build on the basic discipline courses in the student's major.

DEPARTMENT OF GENETICS

Gardner Hall, Room 3513
Phone: 919/515.2292
www.cals.ncsu.edu/genetics/

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

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

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, botany, crop science, environmental sciences, fisheries and wildlife sciences, food science, forestry, horticultural science, medical technology, microbiology, 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

T. J. Monaco, *Head*
B. H. Lane, *Undergraduate Coordinator*
D. J. Werner, *Director of Graduate Programs*
D. W. Monks, *Department Extension Leader*
R. E. Lyons, *Director, JC Raulston Aboretum*

Alumni Distinguished Undergraduate Professor: B.H. Lane; *William Neal Reynolds Distinguished Professor*: D.M. Pharr, *JC Raulston Distinguished Professor and Director of JC Raulston Arboretum*: R.E. Lyons; *Professors*: J.R. Ballington, Jr., T.E. Bilderback, S.M. Blankenship, F.A. Blazich, S.D. Clouse, P.R. Fantz, W.C. Fonteno, R.G. Gardner, L.E. Hinesley, W.E. Hooker, R.E. Lyons, T.J. Monaco, D.W. Monks, J.C. Neal, P.V. Nelson, M.M. Peet, D.M. Pharr, E.B. Poling, M.A. Powell, T.G. Ranney, D.C. Sanders, J.R. Schultheis, C.R. Unrath, S.L. Warren, T.C. Wehner, D.J. Werner; *Faculty Emeriti*: W.E. Ballinger, A.A. Banaduga, L. Bass, J.R. Brooks, Jr., F.D. Cochran, H.M. Covington, A.A. DeHertogh, J.H. Harris, W.R. Henderson, G.R. Hughes, J.M. Jenkins, T.R. Konsler, J.W. Love, C.M. Mainland, C.H. Miller, D.T. Pope, W.A. Skroch, J.H. Wilson, Jr.; *Adjunct Professors*: W.W. Collins, R.L. Sawyer, P.S. Zoner; *Associate Professors*: J.D. Burton, N.G. Creamer, J.M. Davis, J.M. Dole, G.M. Fernandez, M.L. Parker, B.E. Whipker; *Adjunct Associate Professor*: F.C. Wise; *Assistant Professors*: W.G. Buhler, P.A. Lindsey, A.M. Spafford, G.C. Yencho; *Adjunct Assistant Professor*: C.E. Niedziela; *Lecturer*: B.H. Lane; *Research Associate Professor*: J.D. Williamson; *Research Assistant Professor*: B.R. Sosinski; *Researchers*: R.B. Batts, K.V. Pecota, S.D. Rooks; *Extension Specialist*: R.E. Bir; *Extension Associates*: R.A. Allen, E.D. Evans, W.R. Jester, W.E. Mitchem; *Assistant Director of JC Raulston Aboretum*: F.T. Lasseigne; *Associate Members of the Faculty*: G.E. Hoyt (Soil Science), M.D. Boyette (Biological and Agricultural Engineering), 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 at the following addresses:

Science Curriculum in Horticultural Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/schort.htm

Technology Curriculum in Horticultural Science, General Horticulture Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/tchortlh.htm

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 4515
Phone: 919/515.2391

H. M. Hassan, *Head*
G. H. Luginbuhl, *Undergraduate Coordinator*
S. M. Laster, *Director of Graduate Programs*

Professors: P.E. Bishop (USDA), W.J. Dobrogosz, H.M. Hassan, J.M. Mackenzie, L.W. Parks; *Professor Emeriti*: G. H. Elkan, J.J. Perry; *Adjunct Professors*: L.A. Casas, R.E. Kanich, T. Melton, S.R. Tove; *Associate Professors*: J.W. Brown, S.J. Libby; *Adjunct Associate Professors*: J. Caplan, J.M. Ligon; *Assistant Professor*: A. Grundon, M.R. Hyman, J.W. Olson, M.L. Sikes; *Adjunct Assistant Professors*: W. Casey, S.H. Shore; *Teaching Technician*: W.P. Crumpler, V.M. Knowlton; *Lab Supervisor*: T.J. Schneeweis; *Associate Members of the Faculty*: C. Altier (Veterinary Medicine), P. Arasu (Veterinary Medicine), D.T. Brown (Biochemistry), F.J. Fuller (Veterinary Medicine), L. Jaykus (Food Science), R. Kelly (Chemical Engineering), T.R. Klaenhammer (Food Science), W.E. Kloos (Genetics), 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.

CURRICULUM

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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/cumicro.htm

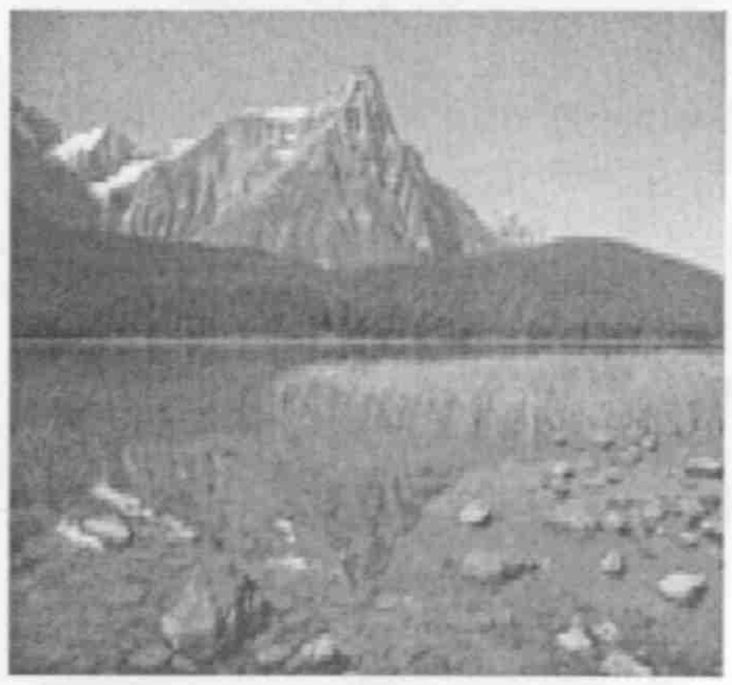
MINOR IN MICROBIOLOGY

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.

CURRICULA IN NATURAL RESOURCES

A. W. Oltmans, *Undergraduate Coordinator*
Agricultural and Resource Economics, Nelson Hall Room 233E
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 strate-

gies 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 at the following addresses:

Curriculum in Natural Resrouces, Economics and Management Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/bsnatres.htm
Curriculum in Natural Resources, Soil Resources Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/cals/natressr.htm
Curriculum in Natural Resources, Soil and Water Systems
www.ncsu.edu/reg_records/ug_catalog/programs/cals/natressw.htm

DEPARTMENT OF PLANT PATHOLOGY

Gardner Hall, Room 2518
Phone: 919/515.2730

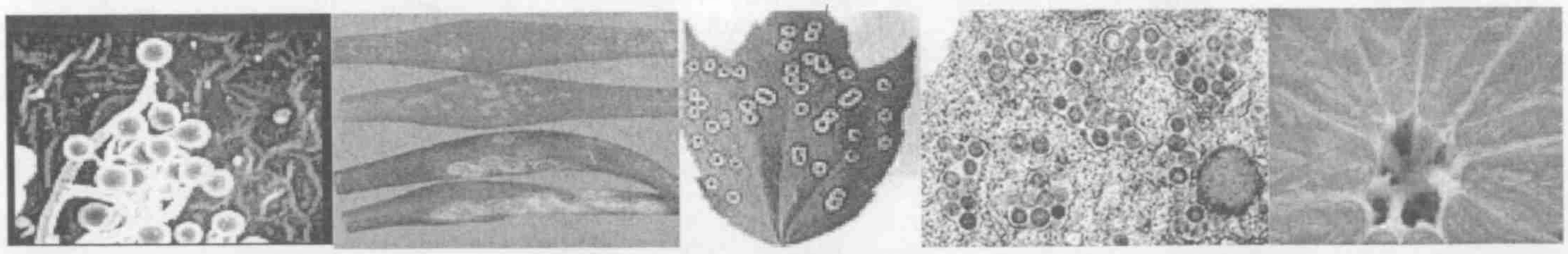
J. W. Moyer, *Department Head*
T. A. Melton, *Departmental Extension Leader*
D. F. Ritchie, *Director of Graduate Programs*
L. F. Grand, *Teaching Coordinator*

Professors: O.W. Barnett, Jr., D.M. Benson, R.I. Bruck, M.E. Daub, J.M. Davis (Head, Department of Botany), R.A. Dean, L.F. Grand, J.S. Huang, S. Leath (USDA), S.A. Lommel (Assistant Vice Chancellor for Research), D.S. Marshall (USDA- Research Leader), T.A. Melton (Phillip J. Morris Professor), J.W. Moyer, C.H. Opperman, G.A. Payne, J.B. Ristanio, D.F. Ritchie, H.D. Shew, T.B. Sutton; *Professors Emeriti*: J.L. Apple, C.W. Averre, III, R. Aycock, K.R. Barker, 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, J.N. Sasser, 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*: D. McK. Byrd, M.A. Cubeta, E.L. Davis, B.C. Haning, P.B. Lindgren, G.J. Holmes, F. Louws, R.G. Upchurch (USDA); *Assistant Professors*: I. Carbone, S. Hu, L.P. Tredway, C.Y. Warfield; *Research Assistant Professors*: S.R. Koenning, T.K. Mitchell, B.B. Shew; *Research and Extension Specialist*: W.O. Cline; *Director*: Z. Pesic-VanEsbroeck; *Adjunct Assistant and Associate Members of the Faculty*: E.B. Cowling (University Distinguished Professor-at-Large), G.M. Hellman (R.J. Reynolds), J.L. Imbriani (NCDA), D.T. Kaplin (USDA, FL), M.D. Law (Novartis), C.M. Liddell (Paradigm Genetics), K.J. Leonard (USDA), S.C. Redlin (USDA), S. Spencer (NCDA), V. Subbiah (R.J. Reynolds).

Undergraduate instruction in plant pathology is designed to provide introductory and advanced courses on the nature and control of plant diseases to students majoring in crop science, horticultural science, agricultural education and forestry. It also provides fundamental training necessary for graduate study in plant pathology. 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/kelman.html.

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, state experiment stations, industry and private consulting. The rapid development of agricultural chemicals, biotechnology and other methods for disease control offers numerous opportunities.



DEPARTMENT OF POULTRY SCIENCE

Scott Hall, Room 203
Phone: 919/515.2626

G. B. Havenstein, *Head*
B.W. Sheldon, *Department Extension Leader*
S. L. Pardue, *Undergraduate Coordinator*
M. A. Quershi, *Director of Graduate Programs*

William Neal Reynolds Professor: J.T. Brake; *Alumni Distinguished Undergraduate Professors*: C.R. Parkhurst, S.L. Pardue; *Professors*: K.E. Anderson, V.L. Christensen, W.J. Croom, Jr., G.S. Davis, F.W. Edens, P.R. Ferket, J.L. Grimes, W.M. Hagler, Jr., G.B. Havenstein, J.F. Ort, J.N. Petitte, M.A. Quereshi, B.W. Sheldon, J.C.H. Shih, T.D. Siopes, M.J. Wineland; *Adjunct Professors*: M.R. Bakst, D. Balnave, W.L. Bryden, R.R. Diertert, K.K. Krueger, K.A. Schat, S.M. Shane, Z. Uni; *Professors Emeriti*: T.A. Carter, J.D. Garlich, E.W. Glazener, P.B. Hamilton, J.R. Harris, C.H. Hill; *Associate Professors*: D.K. Carver, C.M. Williams; *Adjunct Associate Professors*: C.E. Whitfill; *Assistant Professors*: A. Gernat, P.E. Mozdziak; *Adjunct Assistant Professors*: T.F. Middleton, C.J. Williams; *Associate Members of Faculty*: K.M. Keener (Food Science), A.M. Miles (College of Veterinary Medicine), 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 fields 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; the climatic and economic conditions in the state provide a sound base for continued expansion.

OPPORTUNITIES

The change 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 activities such as processing and distribution offer new job opportunities. The allied industries-- feed, equipment, financing, pharmaceutical and other supplies-- need more employees trained in poultry science. Graduates hold positions as managers and field representatives for business identified with or serving the poultry industry. Graduates hold positions as managers and field representatives for businesses identified with or serving the poultry industry. Graduates are also employed in communication and public relations, as teachers, and as extension and research specialists. Some graduates develop their own poultry businesses.

CURRICULA

Students desiring the Bachelor of Science with a major in poultry science may choose either the science or the technology curriculum offered by the Department of Poultry Science. One may obtain a double major in certain other curricula through careful use of electives and/or summer school attendance. The student should consult the undergraduate advisers in the department(s) concerned. Currently, the pre-veterinary science student may utilize all requirements toward a Bachelor of Science degree in the science option.

The science curriculum is for the student interested 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 Pre-Professional Program in Veterinary Medicine).

The technology curriculum in poultry science is designed to prepare students for direct entry into the poultry industry upon graduation; 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 used directly in a poultry operation upon graduation.

Specific curriculum requirements are available at the following address:

Science Curriculum in Poultry Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/scpoult.htm
Technology Curriculum in Poultry Science
www.ncsu.edu/reg_records/ug_catalog/programs/cals/tcpoult.htm

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

(See Humanities and Social Sciences)
1911 Building, Room 301
Phone: 919/515.3180

W. B. Clifford, *Head*
P. L. McCall, *Associate Head*
D. A. Curran, *Undergraduate Coordinator*
D. T. Tomaskovic-Devey, *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. Wimberly; *Alumni Distinguished Graduate Professor:* M.D. Schulman; *Alumni Distinguished Undergraduate Professor:* L.R. Della Fave; *Professors*: V.M. Aldige, W.B. Clifford, T.J. Hoban, J.C. Leiter, P.L. McCall, R.L. Moxley, B.J. Risman, D.T. Tomaskovic-Devey, E.M. Woodrum, M.A. Zahn, M.T. Zingraff; *Professors Emeriti:* J.N. Collins, E.M. Crawford, T.N. Hobgood, Jr., L.B. Otto, M.M. Sawhney, M.E. Voland, J.N. Young; *Associate Professors:* M.P. Atkinson, R.F. Czaja, 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; *Associate Professors Emeriti:* R.C. Brisson, S.K. Garber, P.P. Thompson; *Assistant Professors:* S.M. DeCoster; *Assistant Professors Emeriti:* C.G. Dawson, T.M. Hyman; *Associate Member of the Faculty:* R.D.Mustian (Agricultural and Extension Education); *Adjunct Professor*: A. Thompson (NC A&T University); *Adjunct Associate Professor*: J.R. Thigpen (East Carolina University), 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; *Associate Professors Emeriti:* G.S. Nickerson, J.G. Peck, I. Rovner, M.L. Walek; *Assistant Professor*: R.S. Ellovich.

This department teaches students the principles and techniques for understanding human group behavior. More specifically the department seeks to educate students in understanding communities and organizations and the people who live and work within them, to qualify exceptional students at the undergraduate and graduate level for sociological research, teaching, and extension careers and to solve problems in human group relations. Applied sociology is good training for a wide variety of careers. It is useful for any job that involves work with people, organizations or communities. It is also good preparation for professional organizations or communities and for professional careers in local government, personnel relations, law, the clergy, business and management.

CURRICULA

The Bachelor of Science degree with a major in applied sociology is offered by the College of Agriculture and Life Sciences. This degree includes the study of applied sociological topics and specialty courses in criminology that provide a general background in deviance, juvenile delinquency, the course system and correctional facilities, including field placement in an agency of criminal justice system.

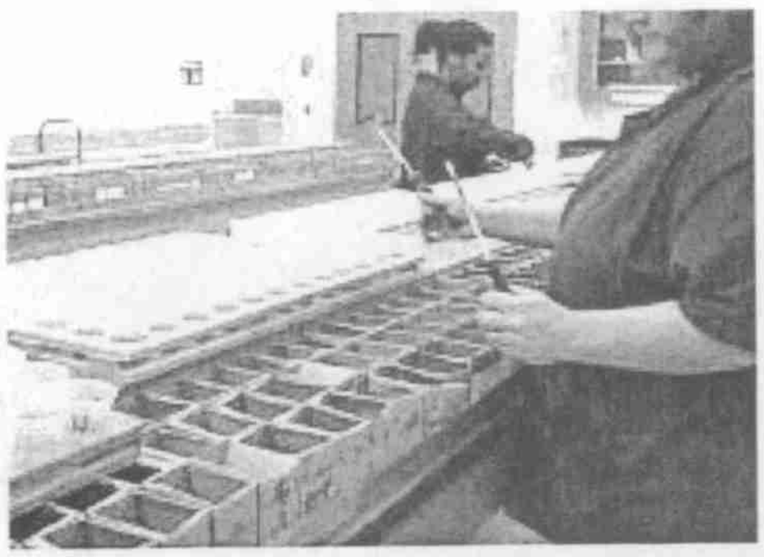
Specific curriculum requirements are available at the following addresses:

Curriculum in Applied Sociology
www.ncsu.edu/reg_records/ug_catalog/programs/cals/applisoc.htm
Curriculum in Criminology
www.ncsu.edu/reg_records/ug_catalog/programs/cals/criminal.htm

MINOR IN APPLIED SOCIOLOGY

The minor in Applied Sociology is aimed at providing a student with the basic conceptual framework of sociology and the information necessary for applying this approach to the resolutions of problems in work and organizational environments. The minor requires 15 credit hours of coursework consisting of required and elective courses, and a grade of "C' or better is required for all courses used to fulfill the minor requirements.

DEPARTMENT OF SOIL SCIENCE



Williams Hall, Room 2234
Phone: 919/515.2655

J. L. Havlin, *Head, Director of Graduate Programs*

D. L. Osmond, *Department Extension Leader*
H. J. Kleiss, *Undergraduate Program Coordinator*

Alumni Distinguished Graduate Professor: S.W. Buol; *William Neal Reynolds Professors*: S.W. Buol, J.W. Gilliam; *Professors*: A. Amoozegar, S.W. Broome, D.K. Cassel, M.T. Hoover, G.D. Hoyt, D.W. Israel (USDA), H.J. Kleiss, C.D. Raper, W.P. Robarge, T.J. Smyth, M.J. Vepraskas, M.G. Wagger; *Adjunct Professors*: P.G. Hunt, R.L. Mikkelsen; *Professors Emeriti*: M.G. Cook, F.R. Cox, C.B. Davey, W.A. Jackson, E.J.

Kamprath, L.D. King, G.S. Miner, J.A. Phillips, P.A. Sanchez, R.J. Volk, A.G. Wollum; *Associate Professors*: D.A. Crouse, C.R. Crozier, D.L. Hesterberg, D.L. Lindbo, R.A. McLaughlin, D.L. Osmond; *Associate Professors Emeriti*: J.P. Lilly, R.E. McCollum, G.C. Naderman, J.E. Shelton; *Adjunct Associate Professors*: R.C. Reich, R. Tucker; *Assistant Professors*: J.W. Rideout, W. Shi, J.A. Thompson, J.G. White; *Adjunct Assistant Professors*: C. Bogle, D. Hardy, C.K. Martin, B.F. McQuaid, B. Zanner; *Associate Members of the Faculty*: H.L. Allen (Forestry), T. Grove (Zoology), R.W. Skaggs (Biological Agricultural Engineering), J.B. Weber (Crop Science), J. Zublena (Cooperative Extension Service).

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.

OPPORTUNITIES

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 Crop Science Department. 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

Gardner Hall, Room 3212
Phone: 919/515.2741
www.cals.ncsu.edu.zoology

T. L. Grove, *Head*
J. F. Gilliam, *Undergraduate Coordinator*
J. A. Rice, *Director of Graduate Programs*

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, C.V. Sullivan, H.A. Underwood; *Adjunct Professors*: F.A. Cross, L.B. Crowder, D.E. Hoss, G.R. Huntsman, P.H. Kelley, G.W. Thayer; *Professors Emeriti*: P.T. Bromley, P.C. Bradbury, B.J. Copeland, W.W. Hassler, M.T. Huish, G.C. Miller, R.L. Noble, T.L. Quay, J.F. Roberts, D.E. Smith, J.G. Vandenbergh; *Associate Professors*: R.K. Borski, H.V. Daniels, J.R. Godwin, J.M. Hinshaw, R.G. Hodson, T.J. Kwak (USDI), S.C. Mozley, M. Niedzlek-Feaver, T.R. Simons (USDI); *Adjunct Associate Professors*: W.J. Fleming, C.S. Manooch, K. Ritters, R.M. Shelley, H.W. van de Veer; *Assistant Professors*: J.A. Bucknel, B.J. Brizuela, N.M. Haddad, J.A. Lubischer, P.S. Rand; *Adjunct Assistant Professors*: E.M. Bennett, A.E. Bogan, S.V. Chiavetta, J.A. Hare, R.J. Kavlock, R.W. Laney, M.R. Meador, M.S. Mitchell, W.E. Palmer, W.C. Starnes; *Adjunct Instructors*: A.L. Braswell, R.B. Hamilton; *Associate Members of the Faculty*: E.J. Jones (Extension Forest Resources), S.B. Harvey (Biological & Agricultural Engineering), 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. Cellular and molecular biology, including reproductive endocrinology and neurobiology, also are 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/cals/szobsz.htm

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 will 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*. The remaining courses must be selected from three- or four-credit zoology courses.

* Grade of C- or better is required.

NORTH CAROLINA AGRICULTURAL RESEARCH SERVICE

Patterson Hall, Room 100

J. L. Oblinger, *Dean, College of Agriculture and Life Sciences*
J. C. Wynne, *Director; Associate Dean of Agriculture and Life Sciences*
S. Leath, *Associate Director, NC Agricultural Research Service*
W. K. Collins, *Coordinator, Tobacco Programs*
J. B. Jett, *Assistant Director; Associate Dean of Natural Resources*
L. Sims, *Assistant Director; Dean for School of Human Environmental Sciences at the University of North Carolina in Greensboro*

The North Carolina Agricultural Research Service is the agricultural, life sciences, forestry, and home economics research agency of the State of North Carolina. It is funded principally by appropriations from the North Carolina General Assembly, federal formula funds, grants, and contracts.

The N.C. Agricultural Research Service provides the following public services:

- conducts research on the development and maintenance of an effective agricultural and forestry industry in North Carolina, including economically sound sources of supplies and equipment needed in agriculture and forestry and market outlets for the products of agriculture and forestry;
- improves rural homes, rural life, and rural environment;
- maintains a reliable supply of agricultural and forestry products for the consuming public. This requires research to solve current problems and research to provide a foundation of scientific knowledge in the biological, physical, and social sciences.

The N.C. Agricultural Research Service faculty brings well-trained personnel to the university whose teaching in many specialized fields of agriculture, biology, and the social sciences assures the maintenance of curricula of high standards. It contributes to the

advanced training of students who are destined to become the leaders, teachers, and investigators necessary in the maintenance of a viable agriculture and forestry industry.

PUBLICATIONS

The N.C. Agricultural Research Service publishes bulletins and scientific papers on research conducted by the staff. Copies of bulletins may be obtained from the Department of Communication Services and scientific papers from authors.

SERVICES

The faculty of the N.C. Agricultural Research Service conduct original and other research bearing directly on and contributing to the establishment and maintenance of permanent and effective agricultural and forestry industries in North Carolina. This research includes field and laboratory experimentation in the biological, physical, social, and environmental sciences. Primary emphasis his given to the production, processing, distribution, and consumption of the many agricultural and forestry commodities produced throughout the state. Also, major attention is given to research programs aimed at improving the quality of life of both rural and urban peoples.

COOPERATIVE EXTENSION SERVICE

Ricks Hall, Room 104

J. L. Oblinger, *Dean, College of Agriculture and Life Sciences*
J. F. Ort, *Associate Dean, Cooperative Extension Service*
J. P. Zublena, *Associate Director, Cooperative Extension Service*
S. A. Zaslow, *Family Consumer Sciences*
R. G. Crickenberger, *Assistant Director, ANR-CRD*
M. A. Davis, *Assistant Director, 4-H and Youth*
R. T. Liles, *Assistant Director, Agriculture and Extension Education*

The Cooperative Extension Service of North Carolina State University is a cooperative undertaking among the United States Department of Agriculture, the State of North Carolina, the 100 countries in the state and the Cherokee Indian Reservation. Its work is supported by federal funds made available under the Smith-Level Act of 1914, as amended by state and county appropriations, and by grants and contracts.

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 the latest and best information-- particularly that which is related to agriculture and natural resources, home economics, and youth, and rural development-- and help them to interpret and use this information to build a more prosperous and satisfying 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 business 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; 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

J. L. Oblinger, *Dean, College of Agriculture and Life Sciences*
K. L. Esbenshade, *Associate Dean, College of Agricultural and Life Sciences and Director, Academic Programs*
J. C. Cornwell, *Assistant 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 ten 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 food and 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 ten areas: Agribusiness Management; Field Crops Technology; General Agriculture; Livestock Management and Technology (General, Swine & Poultry Options); Ornamentals and Landscape Technology; Pest Management (Agricultural and Urban Options); 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 food and agricultural industries and that permit 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, quality control technicians, food service supervisors, sales and service of agricultural equipment and products, food inspectors, 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

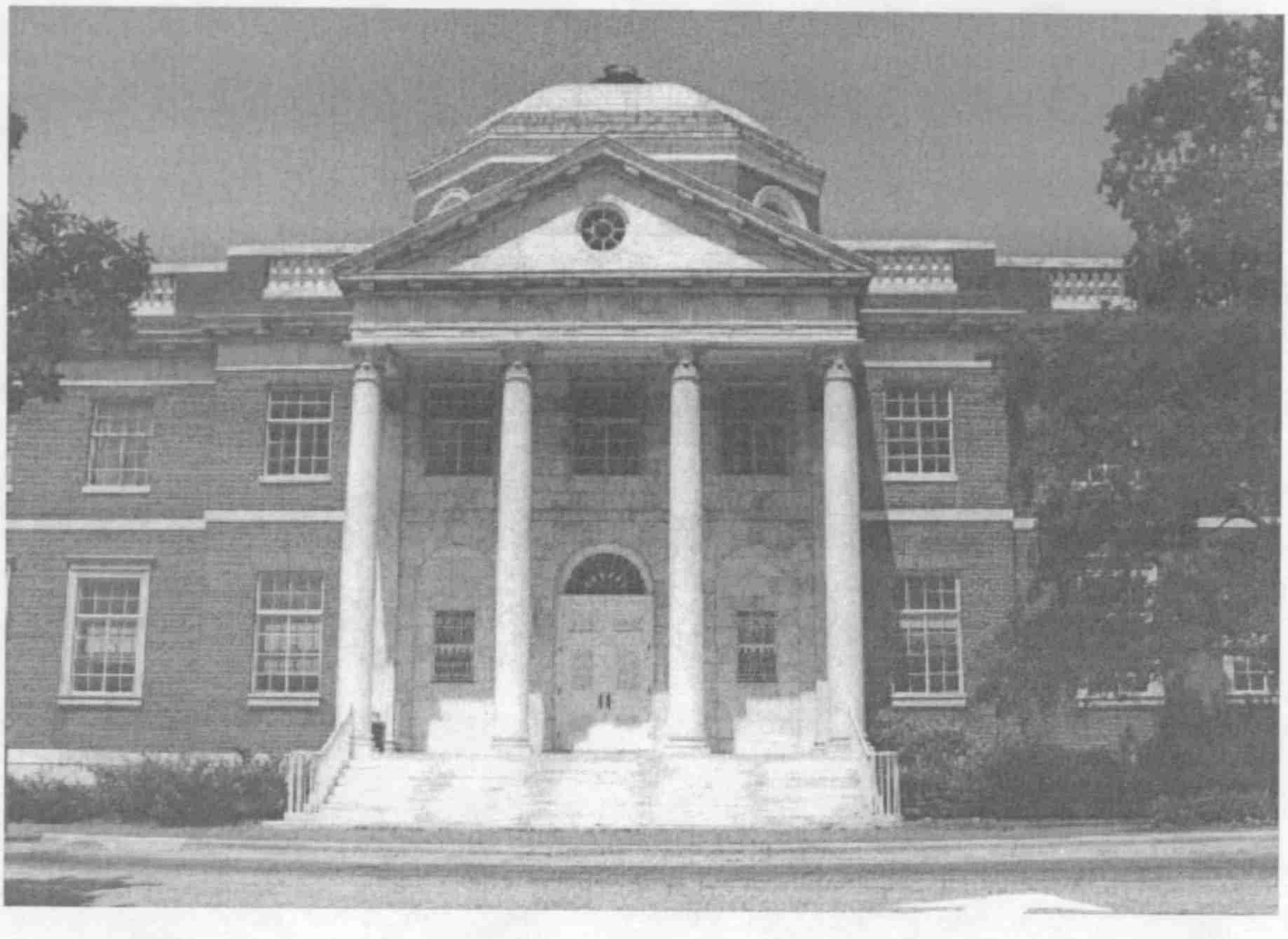
Applicants must have graduated from an accredited high school with at least a 2.0 GPA (on a 4.0 system), or have successfully passed the General Education Development (GED) test before being admitted to the Agricultural Institute at NC State. An admission application and supporting documents must be 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, Telephone: 919/515.3428, website: www.ncsu.edu/cals/agi.

PROGRAMS OF STUDY

Graduates of the Agricultural Institute are awarded the Associate of Applied Science degree. The ten programs of study are Agribusiness Management; Pest Management and Technology (Agricultural and Urban Options); Field Crops Technology; Ornamentals and Landscape Technology; General Agriculture; Livestock Management and Technology (General Livestock Option, Poultry Option, Swine Option); and Turfgrass Management.

COLLEGE OF DESIGN



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Phone: 919/515.9780
Fax: 919/515.7330
email: design@ncsu.edu
www.design.ncsu.edu

Marvin J. Malecha, *Dean*
John Tector, *Associate Dean for Academic Affairs*
Fatih Rifki, *Associate Dean for Graduate Studies*
James Tomlinson, *Assistant Dean for Research, Extension, and Engagement*

Now in its fifth 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

All students entering the College of Design are admitted directly into their specific major of choice. The first year experience consists of a common first semester studio and a major based second semester. Each semester earns 6 credit hours and meets 9 hours per week. The work outside the class is substantial and is largely carried out in the same communal studio space, with students working both independently and in collaboration to solve the problems posed in the class. Most class time is spent in hands-on work, discussion, demonstration, critique, or 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 working habits, talking about the work to others (communication with the language learned in the class), and working in collaboration with others, thus forming the foundation of all subsequent design work, in the College and in the design 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 programs 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 is flexible, 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 in the Master of Architecture, Master of Graphic Design, Master of Industrial Design, Master of Landscape Architecture, and Ph.D. in Design programs. Please refer to the NC State University Graduate Catalog for 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, including a Multi-disciplinary Studies major (admission to the MDS program requires a statement of intent and proposed interdepartmental curriculum that must be approved by the MDS Degree Committee.) 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 Dean's List GPA 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 Academic Affairs 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 Academic Affairs of the College of Design.

For more information, please contact the Associate Dean for Academic Affairs, College of Design, 200B Brooks Hall, Box 7701, NCSU, Raleigh, NC 27695-7701; 919/515.8316.

ANNI ALBERS SCHOLARS PROGRAM

The Anni Albers Scholars Program, collaboration between the NC State University College of Design and the College of Textiles, provides students simultaneously with exemplary preparation in design and in textile and apparel technology. Because NC State University has both renowned Colleges of Design and Textiles, we are in a unique position to provide undergraduate education in textile design, which is unparalleled at other institutions in the US. 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.

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. Anni, 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 Art and Design Department's broad offerings in drawing, painting, sculpture, printmaking, color and light, illustration, animation and digital imaging. The College provides had 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 and apparel. The curriculum provides a fundamental understanding of textile technology in three-dimensional body scanning, direct digital printing on fabric, computer aided design software for both knitted and woven fabrics and apparel product development. CAD/CAM facilities are also available for creating fabrics and garments. 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. Studio space is also available for design of fabrics and garments.

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 using the form and following the guidelines attached. 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. To complete the program successfully, students must meet all requirements for the Bachelor of Art and Design degree in the College of Design, and all college-level requirements for the Bachelor of Science degree in Textile Technology in the College of Textiles, including only one set of 52 credit hours in the General Education Requirements. General Education Requirements are arranged to meet the specified choices in both curricula. The degree requires five (5) school years and one summer to complete. Eventual scholarship support will make this less of a financial burden on the student and family. 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 advisors in both colleges. Individual interests, directions, needs and transfer credits may change the length of time required for completion of the program.

Seminars and Study Abroad Opportunities
Anni Albers Scholars will participate in special programs (seminars, lectures, field trips, study abroad classes, etc.) and meet as a group for regular discussions and advising. Interdisciplinary seminars led by the College of Design and College of Textiles faculty will focus on issues relevant to the nature of the disciplines.

In addition to the study abroad and internship programs regularly offered by the University, the College of Design, and the College of Textiles, every effort will be made to identify opportunities that provide the best fit with each student's academic program and career interest.

For questions, please contact one of the Program advisers:

Professor Susan Brandeis
College of Design, Box 7701
NC State University
Raleigh, NC 27695-7701
Telephone: 919/515.3876
Fax: 919/515.7330
email: susan_brandeis@ncsu.edu

Professor Traci May-Plumlee
College of Textiles, Box 8301
NC State University
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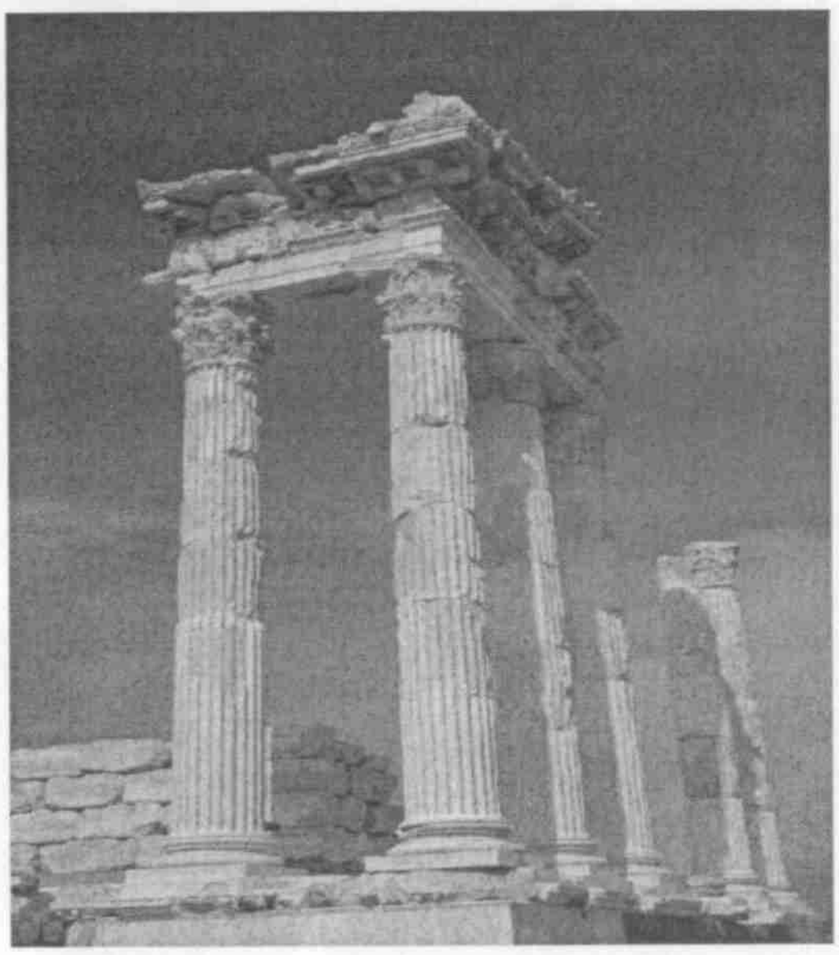
Telephone: 919/513.4196
Fax: 919/515.3733
email: traci_may-plumlee@ncsu.edu

SCHOOL OF ARCHITECTURE

Brooks Hall
Phone: 919/515.8350



T. Barrie, *Director*
J. P. Rand, *Associate Director*

Professors: T. Barrie, P. Batchelor, G. Bizios, R. Burns, R. Clark, M. Malecha, W. Place, J.P. Rand, H. Sanoff, P. Tesar; *Associate Professors*: F. Harmon, F. Rifki, K. Schaffer, J. Tector; *Assistant Professors*: G.P. Borden, W. Redfield, J. Ficca; *Associate Professor Emeritus*: D. W. Barnes; *Adjunct Professors*: C. Bishir, N. Burns, D. Dixon, R. Green, E. Harris, J. Mann, B. Shawcroft; *Adjunct Associate Professors*: R. Cannon, S. Cannon, E. Cassily, P. Freelon, K. Hobgood, J. Lee, W.H. McKinnon, S. Schuster, D. Stallings, E. Weinstein; *Adjunct Assistant Professors*: B. Bell, L. Cherry, M. Cindric, F. Gomes, T. Hicks, D. Hill, M. Humany, R. Lanou, T. Lineberry, K. Lucker, T. Martin, T. McAuliffe, D. Staub, P. Szostak, E. Torre.

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 pre-professional 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 pre-professional 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 and a variety of foreign study programs.

CURRICULA

Specific curriculum requirements are available at the following address:

Curriculum in Architecture, Bachelor of Environmental Design in Architecture
www.ncsu.edu/reg_records/ug_catalog/programs/design/baedar.htm
Curriculum in Architecture- Fifth Year Professional Program, Bachelor of Architecture
ww.ncsu.edu/reg_records/ug_catalog/programs/design/baarch.htm

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 US professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a five-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Masters degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The accredited professional degrees at the School of Architecture at North Carolina State University are the Bachelor of Architecture and the Master of Architecture degrees. The Bachelor of Environmental Design in Architecture is the prerequisite pre-professional degree for both of the professional degrees. The School of Architecture currently enjoys full NAAB accreditation.

DEPARTMENT OF ART AND DESIGN

Leazer Hall
Phone: 919/515.8315

C. Cox, *Chair*

Professors: C. Joyner, M. Pause, S. Brandeis; *Professor Emeritus*: W. Taylor; *Associate Professors*: C. Cox, L.M. Diaz, P. Fitzgerald, D. Raymond, S. Toplikar, C. Raub; *Assistant Professor*: V. Plume; *Adjunct Associate Professor*: K. Rieder.

The Art and Design Department 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 interactive computer graphics, animation, illustration, sculpture, painting, drawing, fiber, exhibition design, and emerging areas in the media arts.

The Art and Design Department 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. Four specific options are currently available: fibers and surface design, painting, drawing, and sculpture.

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, multimedia, illustration, exhibition design, textile design, fashion design, art and design education, photography, film making, special effects, set design, and in all areas of fine art.

CURRICULA AND DEGREES

The Art and Design Department 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 professionally non-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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/design/a%26d99.htm

MINOR IN ART AND DESIGN (NON-DESIGN MAJORS)

The Minor in Art and Design's objectives are to discover basic design 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 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 credit hours of study. A student must successfully complete the two prerequisite courses (ADN 111 and ADN 112 or 6 credit hours approved by the chair of the Art and Design department) before applying for entrance into the Minor in Art and Design. These two courses provide an essential foundation in design. A grade point average of 2.75 or above and a faculty review are also required.

After completion of ADN 111 and ADN 112 (6 credit hours) the student must then complete 9 hours of recommended courses selected from the courses listed in the information provided by the Art and Design department chair. Six (6) hours must be above the 100 level and another three (3) hours at or above the 300 level. A grade of C 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 the guidance of the student's minor adviser and tailored to the needs, interests, and goals of the student.

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 Academic Affairs in the College of Design for an application and assignment of a minor adviser.

DEPARTMENT OF GRAPHIC DESIGN

Brooks Hall
Phone: 919/515.8326

M. Davis, *Department Chair and Director of Graduate Programs*

Professors: M. Davis, M. Scotford; *Associate Professors*: K. Bailey, S. Townsend; *Assistant Professors*: P.A. Brock, L. Churchman.

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, stationary systems, and other related literature for corporations, institutions, businesses, and governmental agencies. Graphic designers create multimedia presentations, web sites, 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 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 support 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 studios and support 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. In the last studio, graduating students prepare their portfolios for job searches and demonstrate their expertise in a particular area of practice.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/design/bargrph.htm

DEPARTMENT OF INDUSTRIAL DESIGN

Brooks Hall
Phone: 919/515.8322

Haig Khachatoorian, *Head*
B. Laffitte, *Director of Graduate Programs*

Professors: V.M. Foote, H. Khachatoorian, G. Lewis; *Professors Emeriti*: A. Cooke; *Associate Professors*: P. Hooper, B. Laffitte.

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 traditional fine art and industrial design to interactive multimedia. Examples of current areas of study include digital imaging, interactive computer graphics, animation, illustration, fibers, product design, furniture design, ergonomics and textile design.

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 furniture design, illustration, 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 the environment. The industrial designer is responsible for human factors engineering safety, shape, color, texture, maintenance, and cost. Industrial designers deal with consumer, as well as industrial products. In order to achieve these ends, designers must be involved in four major design and research ares: human behavior, human-machine relationships, the environment, and the product itself.

Furniture Manufacturing, Apparel Technology, and Textile Technology are concentrations offered through collaborations with the Industrial Engineering Furniture Manufacturing and Management Center and the College of Textiles, respectively. Areas of design investigation 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.

The industrial design curriculum is centered around four major design and research activities: product development and design, product safety, the human/machine relationship, and the ecological impact of a product's life cycle. 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 at the following address:

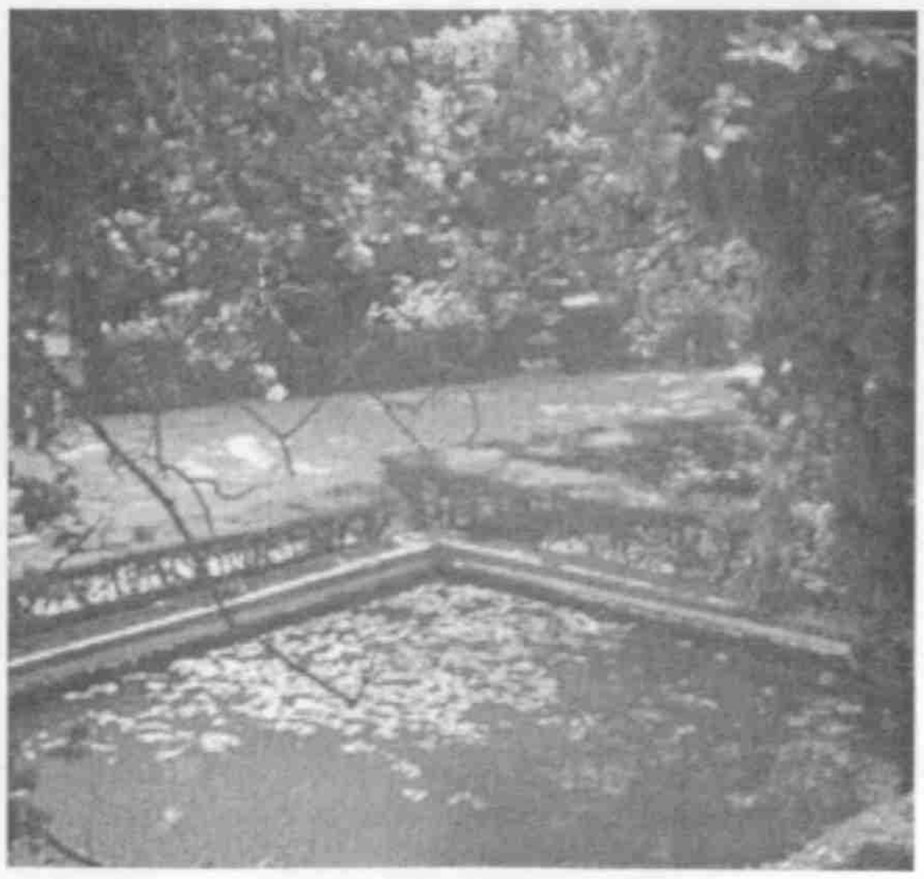
Curriculum in Industrial Design, Bachelor of Industrial Design
www.ncsu.edu/reg_records/ug_catalog/programs/design/bainds.htm
Curriculum, Industrial Design, Apparel Technology Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/design/baaptc.htm
Curriculum, Industrial Design, Furniture Manufacturing Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/design/bafnmn.htm
Curriculum, Industrial Design, Textile Technology Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/design/baidtx.htm

DEPARTMENT OF LANDSCAPE ARCHITECTURE

Brooks Hall
Phone: 919/515.8340

A. Benzinberg-Stein, *Chair*

Professors: A.R. Abbate, R. Moore, A. Benzinberg-Stein, A.R. Rice; *Professors Emeritus*: R.R. Wilkinson; *Associate Professors*: F. Magallanes, S. Raval; *Assistant Professors*: M. Meyers; *Associate Members of the Faculty*: H. Devine (Parks Recreation and Tourism Management); *Research Associate Professor*: J. Tomlinson; *Adjunct Associate Professors*: S. Hatchell, M. Jennings, R. Mandell, W. Swink; *Associate Assistant Professor*: K. Boone.



The mission of the Department of Landscape Architecture is to nurture and education socially and 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 the medium of a comprehensive design education. The program offers an integrated, broad-based education in the discipline of Landscape Architecture and it emphasizes interdisciplinary design 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.

This professional degree program serves individuals who are interested in affecting the environment directly through the profession of landscape architecture. In addition, the department is concerned with fostering an individual's sense of responsibility to society as a steward of the 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/design/balarc.htm

The Department of Landscape Architecture currently enjoys full Landscape Architecture Accreditation Board (LAAB) accreditation.

COLLEGE OF EDUCATION

208 Poe Hall
NCSU Box 7801
Raleigh, NC 27695-7801
Phone: 919/515.2231; Fax:919/515.5901
www.ncsu.edu/ced/

Kathryn M. Moore, *Dean*
Vacant, *Associate Dean for Academic Affairs*
Samuel S. Snyder, *Associate Dean for Research and Graduate Studies*
Deborah E. Andrews, *Director of Teacher Education Program*
Jo-Ann Robinson, *Director of Teaching Fellows Program*
Anona P. Smith, *Assistant Dean for Student Services*
Andy Raynor, *Director, Computing and Network Services*
Beth Cassedy, *Director of Research Development*
Lisa L. Grable, *Director, Learning Technologies Resource Center*

College of Education

The College of Education, as a technologically advanced, diverse learning community prepares educational professionals, advances knowledge through research, and renders service to constituents globally. With emphasis on the preparation of middle grades, high school, and post-secondary teachers, counselors, supervisors, and administrators, the college is committed to being a leader and innovator in research, application, and dissemination of effective strategies for teaching and learning, especially through technology. Composed of the departments of Adult and Community College Education, Educational Research and Leadership and Counselor Education, Curriculum and Instruction, and Mathematics, Science, and Technology Education, the college seeks students dedicated to the development of all persons and sensitive to the complexity of the teaching/learning process.

Undergraduate degree programs are offered in education general studies, business and marketing 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 and business and marketing education (grades 7-12) and mathematics and science education (grades 9-12). Also offered is an undergraduate degree program in middle grades teaching with concentrations either in language arts/social studies or mathematics/science (grades 6-9).

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 7-12).

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 college's teacher education programs are in fields of teacher shortage. Graduates have little difficulty finding teaching positions. Because of limited faculty resources, space in some programs is limited.

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 Community College
Counselor Education
Curriculum and Instruction
Educational Administration
Educational Research and Policy Analysis
Elementary Education Training and Development
Higher Education
Middle Grades Education
Occupational Education
Reading Education
Special Education

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 icensure programs are approved by the North Carolina Board of Education. The college is accredited by the Council for the Accreditation of Counseling and Related Programs (ACREP), 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, a Learning Technology Resource Center, and an Instructional Computing Facility. The building houses laboratories for technology education, reading, science, counseling and testing activities.

SCHOLARSHIPS

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 14 institutions participating in the N.C. Teaching Fellows Program and has over 120 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 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.

HONORS PROGRAMS

The College of Education has an honors' society in education and technology education. Kappa Delta Pi has a chapter on campus, Omicron Rho. It elects those to membership who exhibit the ideals of scholarship, high personal standards, and promise in teaching and allied professions. Kappa Delta Pi is an international honor society of, about, and for educators. Selection as a member is based

on high academic achievement, a commitment to education as a career, and a professional attitude that assures steady growth in the profession.

INTERNATIONAL ACTIVITIES

Several faculty members have been involved in overseas projects in China, Ghana, Japan, 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. The enrollment of international students in several of the education programs and elsewhere at NC State also offers on-campus multi-cultural opportunities.

DEPARTMENT OF ADULT AND COMMUNITY COLLEGE EDUCATION

(See Graduate Catalog)

DEPARTMENT OF CURRICULUM AND INSTRUCTION

Poe Hall, Room 602
Phone: 919/515.3221

E. S. Vasu, *Department Head*
S. S. Osborne, *Director of Graduate Education*
C. M. Beal, *Director of Undergraduate Education*

Professors: C.L. Crossland, B.J. Fox, T.P. O'Brien, C.A. Pope, H.A. Spires, E.S. Vasu; *Associate Professors:* P.L. Marshall, S.S. Osborne, R.J. Pritchard, A.J. Reiman, E.J. Sabornie; *Assistant Professors:* M. Alibrandi, C.M. Beal, A. Foley, W. O'Steen, J. Steelman; *Visiting Assistant Professors:* L.E. Huffman; *Adjunct Professors:* D.D. Copeland, R.A. Edelfelt; *Adjunct Assistant Professors:* S.B. Buckner, L.L. Grable; C.J. Messina, W.R. Parker; *Professor Emeritus:* B.M. Parramore, B.R. Poulton; *Associate Professor Emeritus:* L. Thies-Sprinthall.

The Department of Curriculum and Instruction prepares undergraduate students to become teachers of middle grades language arts and social studies, and secondary business and marketing education. The Department currently includes a diversity of highly qualified students. All programs emphasize scholarship and individually designed study, and include cross-disciplinary work and field-based experiences.

CURRICULUM IN BUSINESS AND MARKETING EDUCATION

Poe Hall, Room 402
Phone: 919/515.1743

T. O'Brien, *Coordinator*

The Business and Marketing Education curriculum is specifically designed to prepare teachers for Business and Marketing Education programs in secondary schools. In addition, it provides the necessary pedagogical and technical preparation needed by business and marketing instructors in community and technical colleges, as well as 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 at the following addresses:
Curriculum in Marketing Education, B.S. in Marketing Education
www2.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/bsmred.htm

CURRICULA IN MIDDLE GRADES EDUCATION

Poe Hall, Room 528
Phone: 919/515.6231

C. Beal, *Coordinator*

Specific curriculum requirements are available at the following address:
Middle Grades Education, Language Arts/Social Studies Concentration
www2.ncsu.edu/reg_records/ug_catalog/programs/edu_psych/culass.htm

Middle Grades Education, Mathematics (with Science) Concentration

General Studies (56-57 semester hours)		Teaching Major	
English and Communication Courses	*Credits*	**(36 semester hours)**	*Credits*
ENG 101 Academic Writing and Research	4	CH 100 or CH 101/102 Chemistry	4
COM 110 or COM 112 or COM 211	3	A Molecular Science/General Chemistry Lab	
	7	CSC 200 Intro. to Computers & Their Uses	3
Humanities and Social Sciences Courses		MA 105 Mathematics of Finance	3
History Elective[a, b]	3	MA 114 Intro. to Finite Mathematics w/Applications	3
Humanities/Social Science Elective[1, 2]	6	MA 141 Calculus I	4
Literature Elective[1, 2]	3	MA 241 Calculus II	4
Social Science Elective[1, 2, c]	3	MA 225 Foundations of Advanced Mathematics	3
Phil., Religion, Vis/Perf Arts Elective[1, 2]	3	MA 308 College Geometry	3
PSY 304 Educational Psychology	3	MA 433 History of Mathematics	3
Sci./Technology/Soc. Elective[d]	3	MEA 130 Weather or PY 124 Solar System Astronomy	3
Multicultural Elective[2, e]	3		**36**
	27	**Professional Studies (39 semester hours)**	
Science Courses		ECI 306 Middle Years Reading	3
PY 131 Conceptual Physics	4	ECI 309 Teaching in the Middle Years	3
BIO 181 Introductory Biology I[f]	4	ED 310 Tutoring Adolescents	3
MEA 101/110 Physical Geology and Lab[g]	3-4	ECI 416 Teaching Exceptional Students in Mainstreamed Classrooms	3
	11-12		
Physical Education and Free Electives		ELP 344 School and Society	3
Any 100 level PE in Fitness & Wellness	1	EMS 101 Orientation to Mathematics & Science Education	0
Physical Education Elective	1	EMS 203 Intro. to Teaching Mathematics and Science	3
PEH 280 Emergency Medical Care/First Aid	*or*	EMS 470 Methods & Materials for Teaching Mathematics[h]	3
PEH 285 Personal Health	2	EMS 471 Student Teaching in Mathematics[8]	8
Free Electives	4	EMS 474 Teaching Mathematics Topics in Middle Grades[8]	3
	8	EMS 480 Teaching Mathematics with Technology	3
		PSY 476 Psychology of Adolescent Development	3
			36

Minimum Hours Required for Graduation[i] **126**

a. Must be chosen from the university's list of approved humanities and social sciences
b. At least one of the indicated courses must be chosen from the non-English speaking cultures list
c. Social Science elective may not be a psychology course
d. Must be chosen from the Sci./Technology/Soc. Elective list (humanities and social sciences perspective)
e. Chosen from ANT 252, COM/ANT/HSS 392, SOC 305, ECI 305
f. Chosen from basic natural sciences elective list. At least two of the three science courses must have a lab
g. Chosen from additional natural sciences elective list
h. Taken together as a block in the fall only. Student teaching is full-time for ten weeks
i. Student must meet University requirements for foreign language

For the most current available information related to this chart, please see the following website:
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/msmsci.htm

Middle Grades Education, Mathematics/Science Concentration

General Studies (39-41 semester hours)	
English and Communication Courses	*Credits*
ENG 101 Academic Writing and Research	4
COM 110 or COM 112 or COM 211	3
	7
Humanities and Social Sciences Courses	
History Elective[a, b]	3
Humanities/Social Science Elective[1, 2]	3
Literature Elective[1, 2]	3
Social Science Elective[1, 2, c]	3
Phil., Religion, Vis/Perf Arts Elective[1, 2]	3
PSY 304 Educational Psychology	3
Sci./Technology/Soc. Elective[d]	3
Multicultural Elective[2]	3
	24
Physical Education and Free Electives	
Any 100 level PE in Fitness & Wellness	1
Physical Education Elective	1
PEH 280 Responding to Emergencies	*or*
PEH 285 Personal Health	2
Free Electives	4-6
	8-10

Teaching Major (51-53 semester hours)	
CH 100 or CH 101/102 Chemistry	4
A Molecular Science/General Chemistry Lab	
CH 201/202 Chemistry: A Molecular Science	4
CSC 200 Intro. to Computers & Their Uses	3
MA 114 Intro. to Finite Math w/Applications	4
MA 131 Calculus for Life & Mgmt Science A	3
MA 231 Calculus for Life & Mgmt Science B	3

Teaching Major (continued)	
	Credits
MA 141 Calculus I	4
MA 241 Calculus II	4
MA 225 Foundations of Advanced Mathematics	3
MA 308 College Geometry	3
MA Elective	3
MEA 101/110 Geology I and Lab	4
Statistics Elective (ST 101, 311, 361, or 371)	3
PY 211 College Physics I	4
PY 212 College Physics II	4
	51-53
Professional Studies (39 semester hours)	
ECI 306 Middle Years Reading	3
ECI 309 Teaching in the Middle Years	3
ED 310 Tutoring Adolescents	3
ECI 416 Teaching Exceptional Students in Mainstreamed Classrooms	3
ELP 344 School and Society	3
EMS 101 Orientation to Mathematics & Science Education	0
EMS 203 Intro. to Teaching Mathematics and Science	3
EMS 470 Methods & Materials for Teaching Mathematics[e]	3
EMS 471 Student Teaching in Mathematics[5]	8
EMS 474 Teaching Mathematics Topics in Middle Grades[5]	3
EMS 475 Methods of Teaching Science[5]	3
EMS 476 Student Teaching in Science	3
PSY 476 Psychology of Adolescent Development	3
	36
Minimum Hours Required for Graduation	**128**

a. Must be chosen from the university's list of approved humanities and social sciences
b. At least one of the indicated courses must be chosen from the non-English speaking cultures list
c. Social Science elective may not be a psychology course
d. Must be chosen from HI 321, 322, 341, 480, 481; PHI 340; MDS 301
e. These courses are taken together as a block in the fall semester only. Student teaching is full time for ten weeks

For the most current available information related to this chart, please see the following website:
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc_msd.htm

Middle Grades Education, Science (with Math) Concentration

General Studies (55 semester hours)	
English and Communication Courses	*Credits*
ENG 101 Academic Writing and Research	4
COM 110 or COM 112 or COM 211	3
	7
Humanities and Social Sciences Courses	
History Elective[a, b]	3
Humanities/Social Science Elective[1, 2]	3
Literature Elective[1, 2]	3
Social Science Elective[1, 2, c]	3
Phil., Religion, Vis/Perf Arts Elective[1, 2]	3
PSY 304 Educational Psychology	3
Sci./Technology/Soc. Elective[d]	3
Multicultural Elective[2, e]	3
	24
Physical Education and Free Electives	
Any 100 level PE in Fitness & Wellness	1
Physical Education Elective	1
PEH 280 Responding to Emergencies	*or*
PEH 285 Personal Health	2
Free Electives	0-4
	4-7
Mathematics Courses	
MA 131 Calculus for Life & Mgmt Science A	3
MA 231 Calculus for Life & Mgmt Science B	3
MA 141 Calculus I	4
MA 241 Calculus II	4

Teaching Major (38 semester hours)	
	Credits
BIO 181 General Biology I	4
BIO 183 Intro Biology II	4
CH 101 Chemistry- A Molecular Science	3
CH 102 Chemistry- General Chemistry Lab	1
CH 201 Chemistry - A Quantitative Science	3
CH 202 Quantitative Chemistry Lab	1
MA 114 Introduction to Finite Mathematics	3
MA 225 Foundations of Advanced Mathematics	3
MA 308 College Geometry	3
MEA 101 Geology I	3
MEA 110 Geology Lab	1
BO 360/365 Introduction to Ecology/Lab	3-4
PY 131 Conceptual Physics	4
PY 123 Stellar & Galactic Astronomy	3
MEA 130/131 Introduction to Weather & Climate/Lab	3-4
ST 311 Introduction to Statistics	3
Science Elective	2
	47-49
Professional Studies (35 semester hours)	
ECI 206 Middle Years Reading	3
ECI 309 Teaching in the Middle Years	3
ECI 416 Teaching Exceptional Students in Mainstreamed Classrooms	3
ED 310 Tutoring Adolescents	1
EMS 476 Student Teaching in Science	3
EMS 477 Instructional Materials in Science	3
EMS 495 Senior Seminar in Math & Science Education	2
PSY 476 Psychology of Adolescent Development	3
	35
Minimum Hours Required for Graduation	**128**

a. Must be chosen from the university's list of approved humanities and social sciences
b. At least one of the indicated courses must be chosen from the non-English speaking cultures list
c. Social Science elective may not be a psychology course
d. Must be chosen from HI 321, 322, 341, 480, 481; PHI 340; MDS 301
e. Must be chosen from ANT 252, COM/ANT/HSS 392, SOC 305, ECI 305)

For the most current available information related to this chart, please see the following website:
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/mss.htm

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 homes, day care, 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 at the following addresses:

Emphasis A
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/gensta.htm

Emphasis B
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/genstb.htm

ENGLISH TEACHER EDUCATION

Poe Hall, Room 408C
Phone: 919/515.1784

Laura Severin, *Coordinator of Advising*

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 at the following address:
www2.ncsu.edu/reg_records/ug_catalog/programs/chass/engtched.htm

FRENCH TEACHER EDUCATION

1911 Building, Room 126
Phone: 919/515.9293

Diane Adler, *Coordinator of Advising*

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.

DEPARTMENT OF MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

Poe Hall, Room 326
Phone: 919/515.2238
www2.ncsu.edu/ncsu/cep/mstel

J.E. Penick, *Head*
Alice Y. Scales, *Assistant Head*
J. R. Kolb, *Director of Graduate Programs for Mathematics Education*
J. C. Park, *Director of Graduate Programs for Science Education*
R. E. Wenig, *Director of Graduate Programs for Technology Education*

Alumni Distinguished Undergraduate Professors: J.R. Kolb, J.C. Park, L.V. Stiff, L.W. Watson; *Professors*: L.M. Clark, J.R. Kolb; *Professors Emeriti*: D.A. Adams, N.D. Anderson, A. Howe, H.E. Speece; *Associate Professors*: G.S. Carter, V.W. DeLuca, W.J. Haynie III, K.S. Norwood, J.C. Park, R.E. Peterson, R. Tzur, W.M. Waters, Jr., L.W. Watson, R.E. Wenig, J.H. Wheatley; *Associate Professor Emeritus*: H.A. Shannon; *Research Associate Professor*: H.S. Stubbs; *Assistant Professors*: T.J. Branoff, A. Clark, K. Flanagan, L.A. Haefner, K. Hollebrands, E. Parsons, A.Y. Scales, E.N. Wiebe; *Assistant Professor Emeritus*: J.L. Crow, W.J. Vanderwall; *Instructors*: B. Matthews; *Lecturer*: 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 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.

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.

CURRICULA IN MATHEMATICS EDUCATION

Poe Hall, Room 326D
Phone: 919/515.6909

L.V. Stiff, *Coordinator*

Mathematics Education, Grades 9-12 Licensure

General Studies (54-57 semester hours)	
English and Communication Courses	*Credits*
ENG 101 Academic Writing and Research	4
COM 110 or COM 112 or COM 211	3
	7
Humanities and Social Sciences Courses	
History Elective[a, b]	3
Humanities/Social Science Elective[1, 2]	3
Literature Elective[1, 2]	3
Social Science Elective[1, 2, d]	3
Phil., Religion, Vis/Perf Arts Elective[1, 2]	3
PSY 304 Educational Psychology	3
Sci./Technology/Soc. Elective[e]	3
Multicultural Elective[2, f]	3
	24
Science Courses	
Physical Science[g]	8
Natural Science Electives	3-4
	11-12
Physical Education and Free Electives	
Any 100 level PE in Fitness & Wellness	1
Physical Education Elective	1
Free Electives	6-9
	8-11
Teaching Major (43-46 Semester Hours)	
Core Courses (required of all students)	
E 115 Intro. to Computing Environment	1
CSC 112 or 114 Intro. to Computing C++	or
CSC 116 Intro. to Computing JAVA	3
MA 141 Calculus I	4
MA 241 Calculus II	4

Teaching Major (continued)	
Specializations (choose one of these)	*Credits*
Mathematics	
MA 225 Foundations of Advanced Mathematics	3
MA 341 Applied Differential Equations I	3
MA 405 Introduction to Linear Algebra and Matrices	3
MA 433 History of Mathematics	3
Math Elective[c]	3
	15
Computer Science	
MA 225 Foundations of Advanced Math *or*	3
CSC 224 Applied Discrete Math *or*	3
CSC 226 Discrete Math for Computer Scientists *or*	3
CSC 214 Programming Concepts *or*	3
CSC 316 Data Structures for Computer Scientists	3
MA 305 Elementary Linear Algebra	3
MA 405 Introduction to Linear Algebra and Matrices	3
CSC Elective	3
	18
Statistics	
MA 225 Foundations of Advanced Mathematics	3
MA 305 Elementary Linear Algebra	3
MA 405 Intro. to Linear Algebra and Matrices	3
ST 301 Statistical Methods I/ ST 302 Statistical Methods II	6
ST 421 Intro to Math Stats I/ ST 422 Intro to Math Stats II	6
	18
Professional Studies (required of all students, 30 hours)	
ECI 416 Exceptional Children in Mainstreamed Classrooms	3
ED 310 Tutoring Adolescents	3
ELP 344 School and Society	3
EMS 101 Orientation to Math & Science Education	0

MA 242 Calculus III	4	EMS 203 Intro to Teaching Mathematics and Science	3
	3	EMS 470 Methods and Materials for Teaching Math[h]	3
MA 408 Foundation of Euclidean Geometry	3	EMS 471 Student Teaching in Mathematics[8]	8
LOG 201 Logic	3	EMS 472 Teaching Mathematics Topics in Senior High[8]	3
ST 101 Statistics by Example		EMS 480 Teaching Mathematics with Technology	3
		PSY 476 Psychology of Adolescent Development	3
			30
		Minimum Hours Required for Graduation[i]	**126**

a. Must be chosen from the university's list of approved humanities and social sciences
b. At least one of the indicated courses must be chosen from the non-English speaking cultures list
c. Must be a course at 200-level or above
d. Social Science elective cannot be a Psychology Course
e. Must be chosen from the University's Sci./Technology/Soc. Elective list
f. Chosen from ANT 252, COM/ANT/HSS 392, SOC 305, or ECI 305
g. Must choose one of the following two course sequences:
CH 101/102, CH 201/202 or PY 205-208, PY 211-212
h. These courses are taken together
i. Student must meet University requirements for foreign language

For the most current available information related to this chart, please see the following website:
www.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/med.htm

CURRICULA IN TECHNOLOGY EDUCATION

Poe Hall, Room 502
Phone: 919/515.1748

W.J. Haynie III, *Coordinator*

Specific curriculum requirements are available at the following addresses:
Non-Licensure Option
www2.ncsu.edu/reg_records/ug_catalog/programs/edu_psyc/tednon.htm
Licensure Option
www2.ncsu.edu/reg_recrods/ug_catalog/programs/edu_psyc/tedlin.htm

MINOR IN GRAPHIC COMMUNICATIONS

Poe Hall, Room 510
Phone: 919/515.1754

A.Y. Seales, *Coordinator*

This 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 thought 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 in engineering or technology education.

SOCIAL STUDIES TEACHER EDUCATION

Poe Hall, Room 528
Phone: 919/515.9655

K.A. Troost, *Coordinator of Advising, Sociology*
G. Surh, *Coordinator of Advising, History*
K. Vickery, *Coordinator of Advising*
S. Carey, *Coordinator of Advising, Political Science*

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, consult the Middle Grades Education description.

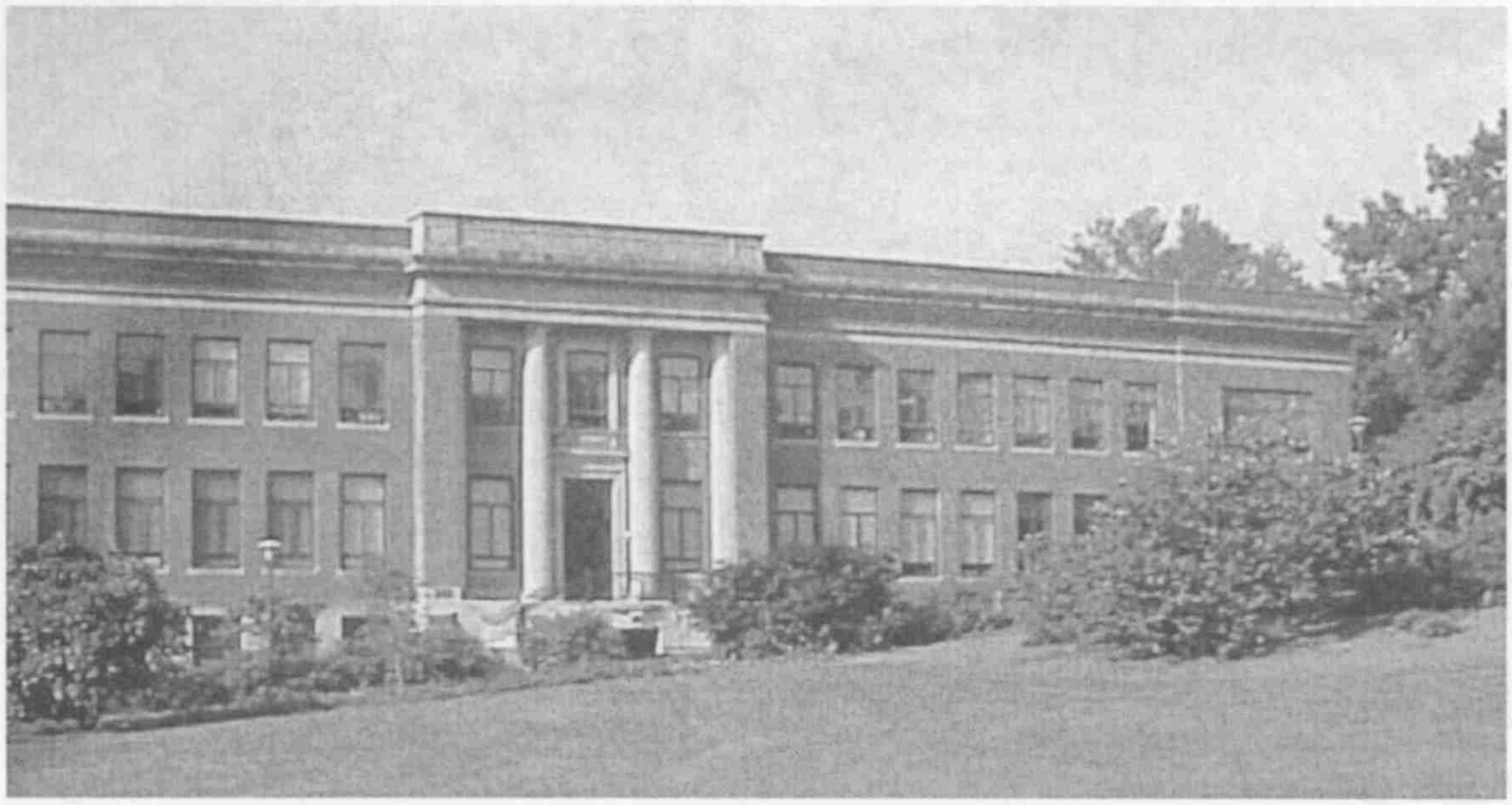
SPANISH TEACHER EDUCATION

1911 Building, Room 142
Phone: 919/515.9288

Susan Navey-Davis, *Coordinator of Advising*

Students desiring to become teachers of Spanish will be enrolled in the College of Humanities and Social Sciences. The curriculum requirements for the teacher education option in Spanish can be found under Foreign Languages and Literatures in the College of Humanities and Social Sciences section.

COLLEGE OF ENGINEERING



Page Hall, Rooms 118 & 120
NCSU Box 7904
Raleigh, NC 27695-7904
Phone: 919/515.2315; Fax: 919/515.8702
email:engineering@ncsu.edu
www.engr.ncsu.edu

N. A. Masnari, *Dean*
R. F. Keltie, *Associate Dean for Academic Affairs*
S. A. Rajala, *Associate Dean for Research and Graduate Programs*
T. K. Miller, *Associate Dean for Distance Education and Information Technology*
J. Strenkowski, *Assistant Dean for Research Programs*
J. P. Lavelle, *Assistant Dean for Academic Affairs*
T. L. Mitchell, *Assistant Dean for Engineering Student Services*

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. The faculty, together with the curricula of the undergraduate and graduate programs, offer 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 impact that their creations may have on society. in addition to safety, aesthetics, economics, and energy, today's technologist must consider environmental, sociological, and other "human concern" costs.

The college's graduates may be found in widely diversified careers throughout the world. Most are practicing in the engineering profession, but because their education has equipped them well to deal with problems in a wide variety of fields, many College of Engineering graduate have become corporate presidents, leaders in government, lawyers, and medical doctors, to name a few. The College of Engineering is organized into eleven departments. Biological and Agricultural Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Science, Electrical and Computer Engineering, Industrial Engineering, Material Science and Engineering, Mechanical and Aerospace Engineering, Nuclear Engineering, and Textile Engineering, Chemistry and Science. Seventeen undergraduate degree programs are offered in these eleven 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 professional degrees, 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 thirteen of its undergraduate engineering degree programs. These are aerospace engineering, biological engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, environmental engineering, industrial engineering, industrial engineering-furniture manufacturing, materials science and engineering, mechanical engineering, nuclear engineering, and textile engineering. 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 matriculate 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 at least 28 credit hours, including 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.

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 BS 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 engineering, civil engineering, construction management, computer engineering, computer science, electrical engineering, environmental engineering, industrial engineering, industrial engineering-furniture manufacturing option, materials science and engineering, mechanical engineering, nuclear 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. In addition, required courses in one curriculum program can be completed in five years. Students interested in such a program should consult the Office of Academic Affairs (118 Page Hall).

Students may earn a Bachelor of Science degree in Engineering and an MBA during a five-year course of carefully planned study. Students interested in this option should contact their respective department directly.

Other students may wish to combine a Bachelor of Science in engineering or computer science with a Bachelor of Science or Bachelor of arts degree in another college or school at NC State University. Here also, 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.

STUDENT ACTIVITIES

Each curriculum in the College of Engineering has a technical society open to every student enrolled in the curriculum. 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.

Student representatives may serve on the Engineer's Council. The Council is the coordinating agency for college-wide activities such as the Engineers' Week, the Annual Engineering Career Fair, and the Senior Awards Banquet.

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 focus 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. The courses will be distributed as designated below.

- Select a beginning economics course, EC 201, ARE 201, or EC 205.
- Select two courses from the list of history courses or two from the list of literature courses, or one from each list.
- Select one course from the list of philosophy, religion, and visual/performing arts courses.
- Select one course from the list of science, technology, and society courses.
- Select one course from the following social science areas: anthropology, cultural geography, politics and government, psychology, or sociology.
- Select one other course from any of the approved College of Engineering Humanities and Social Sciences list.

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. Unmatriculated engineering 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, 212 Peele Hall.

BENJAMIN FRANKLIN SCHOLARS PROGRAM

A limited number of freshmen in the College of Engineering are selected to participate in the Benjamin Franklin Scholars program. In addition to their major courses, each Benjamin Franklin Scholar develops an individualized, five-year plan of work focused on a central theme in the humanities and social sciences. Students completing the program receive a Bachelor of Science in an engineering discipline or computer science and a Bachelor's degree in multidisciplinary studies.

This double-degree program provides a unique opportunity to integrate a solid base of knowledge in technology or science with a broad philosophical perspective of the humanities. The curriculum for the double-degree program has four main components: (1) a strong general education, (2) specifically designed interdisciplinary and problem-defining courses, (3) all technical course requirements associated with the engineering or computer science degree, and (4) a thirty-hour multidisciplinary concentration designed by students in consultation with their advisors. With careful planning, this program can be completed in five years.

For more information, contact Dr. Joseph Herkert, Department of Multidisciplinary Studies.

COMPUTERS

During their first semester, new freshmen in the College enroll in a computer literacy course, E 115, which is taught using the Eos student computing facility. Following completion of E 115, it is expected that students will incorporate the use of Eos workstations into all curricular areas, including the preparation of reports and papers in non-technical subjects. In either the freshman or sophomore year, most students will complete a course in computer programming and, thereafter, will increasingly use computers as an engineering tool. The College policy is that all of its students will be provided with the computing resources required to successfully complete their course of study. However, some students may find that owning a computer is beneficial in terms of convenience and ready access to computational capability.

INTERNATIONAL OPPORTUNITIES

The College is actively working to provide its students with opportunities for overseas work and study experience. In addition to the Study Abroad Program, which is available to all students at NCSU, College of Engineering students can participate in an exchange program with the Universite' de Technology de Compe'gne, France, among others.

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 appropriate programs from four-year institutions, as well as junior and community colleges.

Students currently attending or anticipating attendance at other institutions are advised to contact the Office of Academic Affairs for information regarding admission to NC State and credit for courses taken elsewhere.

PROFESSIONAL DEGREES

The College of Engineering offers professional curricula leading to the degrees of Aerospace Engineer, Chemical Engineer, Civil Engineer, Industrial Engineer, and Mechanical Engineer, or Nuclear Engineer. This program is designed for engineering students holding baccalaureate degrees who find that an additional year of education is desirable, for practicing engineers who desire to take a year of professional work to update their training, and for students holding physical science or mathematics degrees who seek a professional level of education in engineering. The program is intended to be sufficiently flexible to meet a wide variety of student needs, and to emphasize professional course work. The curriculum consists of a minimum of 30 hours of credit at the 400 level or above, including at least 15 hours of credit at the 500 level or above.

Applicants who hold the bachelor's degree in engineering, physical sciences, or mathematics may be admitted to the professional program of the College of Engineering upon application and presentation of official credentials. For unconditional admission, these credentials must show a minimum grade point average of 2.5 overall. Admission on a provisional basis may be granted to applicants who do not meet the formal requirements. In the case of insufficient preparation, prerequisite courses will be prescribed in addition to the normal fifth year requirements.

Completion of the professional degree program does not qualify the recipient to sit for the Fundamentals of Engineering examination.

The following requirements of the College of Engineering will be observed:

1. Professional degree students are admitted through the Undergraduate Admissions Office as fifth year professional degree (PR) students. They are subject to rules and regulations as established and administered by the Dean of the College of Engineering.
2. Application forms for admission to the professional degree program should be completed and submitted to the Assistant Dean for Academic Affairs at least 60 days in advance of the semester in which admission is sought. Acceptance of a student for the professional program is based on the recommendation of his/her department and the approval of the Assistant Dean for Academic Affairs. At the time of acceptance, NC State students may transfer a limited number of excess credits to their professional program.
3. A limited amount of credit to be applied toward the requirements for the professional degree may be transferred to NC State from recognized institutions offering advanced work in engineering and related fields. Such a transfer of credit must be approved by the department in which the students do their major work and by the dean of the College of Engineering.
4. A graduate in one field of engineering may choose to work for a professional degree in another field provided he or she has the permission of the department. The student will be expected to take necessary prerequisite courses in addition to those required for the professional degree program.
5. Each fifth year students will be assigned to an advisor in the sponsoring department. The function of the advisor is to assist the students in preparing a program of study and to counsel them with regard to academic work. Prior to the midterm of the first semester, the students and their advisers should agree on a program of study for the professional degree. Program of Study for Professional Degree forms will be prepared and submitted to the office of the Assistant Dean for Academic Affairs as well as to the department. Upon approval of the Office of the Dean, this becomes the student's degree program.
6. Grades for each completed course are reported to the Dean of the College of Engineering and to the Office of Registration. A minimum grade of "C" must be made in each course to obtain credit. A quality grade point average of 2.5 in all course work must be maintained to satisfy requirements for a professional degree.
7. All courses taken by the student after admission to the professional program will count toward the overall grade point average even though an individual course may not be a part of the degree program.
8. A student who falls below a 2.5 average will be placed on probation and given one semester to raise the overall average up to a 2.5. If the student has been admitted on a provisional basis, he or she must make a 2.5 average the first semester in order to continue.

9. Work completed more than six years prior to the date on which the professional degree is to be granted may not be used as credit toward the professional degree, unless approved by the head of the department concerned and the Assistant Dean for Academic Affairs.
10. A professional degree student who has been admitted to the Graduate School may, with the approval of a Master's Degree committee and the Graduate School, transfer nine hours of credit for courses in which a grade of "B" or higher was received.
11. A student may transfer only once, that is, from the Professional Degree Program to the Graduate School or from the Graduate School to the Professional Degree Program. Therefore, a student is not permitted to return to either program after having transferred from that degree program.
12. It is intended that professional degree students will complete a substantial portion of credit hours toward the degree while in residence on the NC State campus.

DEPARTMENT OF BIOLOGICAL AND AGRICULTURAL ENGINEERING

David S. Weaver Laboratories (Room 100)
Phone: 919/515.2694
www.bae.ncsu.edu
(Also see Agriculture and Life Sciences)

J. H. Young, *Head*
R. O. Evans, Jr., *Department Extension Leader*
C. G. Bowers, Jr., *Undergraduate Coordinator*

Distinguished University Professor and William Neal Reynolds Professor: R.W. Skaggs; *Professors*: C.F. Abrams, Jr., D.B. Beasley, S.M. Blanchard, C.J. Bowers, Jr., M.D. Boyette, F.J. Humenik, G.D. Jennings, T.M. Losordo, J.E. Parsons, R.P. Rohrbach, A.R. Rubin, R.S. Sowell, L.F. Stikeleathers, P.W. Westerman, T.B. Whitaker (USDA), D.H. Willis, J.H. Young; *Adjunct Professors*: L.M. Safley, Jr., S.S. Schiffman, L.F. Sykes; *Professors Emeriti*: J.C. Barker, G.B. Blum, Jr., J.W. Dickens, L.B. Driggers, J.M. Fore, G.W. Giles, E.G. Humphries, W.H. Johnson, G.J. Kriz, W.F. McClure, F.M. Richardson, R.E. Sneed, C.W. Suggs, R.W. Watkins, E.H. Wiser; *Associate Professors*: G.R. Baughman, J.J. Classen, R.O. Evans, Jr., S.A. Hale, R.L. Huffman, G.T. Roberson; *Research Associate Professors*: S.K. Lehir; *Extension Associate Professors*: J. Spooner; *Assistant Professors*: J. Cheng, P.L. Mente; *Research Assistant Professors*: G.M. Chescheir; *Extension Assistant Professor*: G.L. Grabow; *Adjunct Assistant Professors*: D.D. Archibald, R.L. Langley, S.K. Seymour; *Extension Specialists*: W.F. Hunt, D.E. Line, J.M. Rice, R.L. Sherman; *Associate Members of the Faculty*: C.R. Daubert (Food Science), B.E. Farkas (Food Science), A.E. Hassan (Forestry), K.M. Keener (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 "BS 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 Accreditation Board for Engineering and Technology. 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 (BS) 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 inter-disciplinary 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 combine to the future economic and social well-being of North Carolina.

Specific curriculum requirements are available at the following address:

Curriculum in Biological Engineering, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsbioe.htm
Curriculum in Biological Engineering, Agricultural Engineering Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsageng.htm
Curriculum in Biological Engineering, Biomedical Engineering Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsbiomed.htm
Curriculum in Biological Engineering, Bioprocess Engineering Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsbiopro.htm
Curriculum in Biological Engineering, Environmental Engineering Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsenvir.htm

DEPARTMENT OF BIOMEDICAL ENGINEERING

432 Daniels Hall
Phone: 919/515.3578
www.bme.ncsu.edu

H. T. Nagle, *Interim Head*
S. M. Blanchard, *Interim Associate Head and Undergraduate Coordinator*

Professors: C.F. Abrams, Jr., S.M. Blanchard, S.L. Cooper, H.T. Nagle; *Associate Professors*: M.G. McCord; *Assistant Professors*: P.L. Mente.

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 and pharmacy schools.

CURRICULUM

The department offers the Bachelor of Science in Biomedical Engineering. The objectives of the curriculum are
(1) To educate students to be successful in biomedical engineering by emphasizing engineering and biology as related to basic medical sciences and human health, (2) To produce biomedical engineers able to communicate effectively with diverse audiences and prepared to work in multidisciplinary teams, (3) To develop in students professional, ethical, and societal responsibility in biomedical engineering practices, and (4) To expose students to advances in biomedical engineering practice and research and to instill in them a life-long thirst for knowledge. 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 BMU as their curriculum choice.

The current specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsbiomed.htm

SCHOLARSHIPS

Students in this degree program are eligible for scholarships from the College of Engineering and the College of Agriculture and Life Sciences.

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 Daniels Hall, Weaver Laboratories, the College of Textiles, and various other academic areas on campus. Contact offices for advising are maintained in Daniels Hall and in Weaver Laboratories. Extensive internet and video-conferencing capabilities are deployed to facilitate convenient faculty-student contact.

Research facilities are located Weaver Laboratories, Daniels Hall, 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 ENGINEERING

Riddick Engineering Laboratories, Room 113
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; *Distinguished University Professors*: D.F. Ollis, K.E. Gubbins; *Alcoa Professors*: C.K. Hall, R.M. Kelly; *Camille Dreyfus Professor*: H.B. Hopfenberg; H. Clark; *Hoechst-Celanese Professors*: R.G. Carbonell, R.M. Felder; *Professors*: K.J. Bachman, R.G. Carbonell, S.L. Coopel, J.M. DeSimone, P.S. Fedkiw, K.E. Gubbins, C.K. Hall, H.B. Hopfenberg, R.M. Kelly, S.A. Kahn, P.K. Kilpatrick, P.K. Lin, D.F. Ollis, M.R. Overcash, G.N. Parsons, G.W. Roberts; *Adjunct Professors*: A.L. Andrady, M.L. Balmer-Miller, C.R. Daubert, G.K. Fleming, D.J. Hammond, D.J. Kiserow, J.B. McClain, I. Pinnau, C. Quah, K.L. Roberts, M. Sliwinskia-Bartowiak, J.J. Spivey, A.H. Weher, R.F. Weimer, S. White, J.L. Williams, P. Vlcek; *Professors Emeriti*: K.O. Beatty, R.M. Felder, J.K. Ferrell, C.J. Setzer, H.Winston; *Associate Professors*: C.S. Grant, H.H. Lamb, S.W. Peretti, R.J. Spontak; *Assistant Professors*: J. Genzer, J.M. Haugh, J. Van Zanten.

The sound management of material, environmental, and energy resources, taking into account natural economic constraints, guides the performance of chemical engineering practice. Chemical 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 four floors comprising the east wing of the Riddick Engineering Laboratories. 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 2,000 square foot biotechnology laboratory has been equipped to include a pilot plan for studying biologically-mediated chemical reactions. 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 engineering graduates often pursue careers in law or the medical sciences since the broadly structures undergraduate curriculum provides strong preparation for graduate study in a wide range of professional specialties.

MINOR IN CHEMICAL ENGINEERING

In addition to B.S. graduates of the chemical 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 Coordinator of Advising in the Department of Chemical 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 though, 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 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; telephone: 410/341.7700.

Specific curriculum requirements are available at the following address:

Curriculum in Chemical Engineering, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bschme.htm
Curriculum in Chemical Engineering, Biosciences Option
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsbch.htm
Curriculum in Chemical Engineering, Electronic Materials Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsemch.htm
Curriculum in Chemical Engineering, Pollution Prevention Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/pollprev.htm
Curriculum in Chemical Engineering, Polymer Science Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/polymsci.htm
Curriculum in Chemical Engineering, Honors Program
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/honorche.htm
Curriculum for Dual Degree, BS Chemical Engineering/MS Management
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/chengmgt.htm

PROGRAM EDUCATIONAL OBJECTIVES

Our department's mission is to excel in teaching and research within the discipline of chemical 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 in chemical engineering allows the student to develop an understanding of the 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 nanoscience concentration in chemical engineering 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 ENGINEERING

Mann Hall, Room 203
Phone: 919/515.2331
www.ce.nscu.edu

E. Downey Brill, Jr., *Head*
D. W. Johnston, *Associate Head for Graduate Programs*
M. A. Barlaz, *Associate Head for Undergraduate Programs*
D. W. Parrish, *Coordinator of Advising*

Distinguished Professor of Civil Engineering and Construction: S. Rizkalla; *Professors*: M.A. Barlaz, J.W. Baugh, Jr., E.D. Brill, Jr., R.C. Border, R.H. Borden, J.S. Fisher, M.A. Gabr, A.K. Gupta, D.W. Johnston, N.P. Khosla, Y.R. Kim, H.R. Malcom, V.C. Matzen (Alumni Distinguished Undergraduate Professor), A Mirmiran, J.M. Nau (Alumni Distinguished Undergraduate Professor), W.J. Rasdorf, N.M. Rouphail; *Adjunct Professor*: K.H. Reckhow; *Distinguished University Professor Emeritus*: J.M. Hanson, P.H. McDonald, P.Z. Zia; *Professors Emeriti*: M. Amein, P.D. Cribbins, R.A. Douglas, J.F. Ely, K.S. Havner, C.L. Heimbach, Y. Horie, S.W. Nunnally, C.C. Tung, H.E. Wahls; *Associate Professors*: L.E. Bernold, A.C. Chao, H.C. Frey, T. Hassan, J.E. Hummer, D.R.U.Knappe, M.L. Leming, M.F. Overton, M.S. Rahman, S.R. Ranjithan, J.R. Stone, A.A. Tayebali; *Adjunct Associate Professors*: L.R. Goode, P.C. Lambe, D.R. van der Vaart; *Associate Professors Emeriti*: W.L. Bingham, E.D. Gurley, J.C Smith; *Assistant Professors*: F.L. de los Reyes, J.J. Ducoste, M.N. Guddatie, A. Gupta, M.J. Kowalsky, D.F. Laefer, G. Mahinthakumar, B.M. Williams; *Research Assistant Professor*: D.H. Loughlin; Lecturer: R.A. Nunez, E.C. Weaver; *Instructor*: E.A. Sumner; *Adjunct Assistant Professor*: J.D. Bowen, J.C. Brantly; *Adjunct Lecturers*: B.A. Doll, B. Koehler, D.J. Lombardi; *Interinstitutional Adjunct Faculty*: J.S. Wu, L.E. King, R.A. Luettich, S.M. Rogers, Jr.

The Department of Civil 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, 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; telephone: 410/347.7700. Graduation from an ABET accredited engineering degree is the first step toward registration 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 Engineering has well-equipped laboratories, including a computer laboratory. The College of Engineering at NCSU 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 Civil 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. A new classroom outfitted for computer-based instruction opened in Mann Hall in January 2003.

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 load-

ing; and large pits up to 20 feet deep for testing granulary 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

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.

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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/civencurr.htm

Educational Objectives in Civil Engineering
The Department of Civil 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. 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.

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 at the following address:
Construction Engineering and Management, General Construction Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscegc.htm
Construction Engineering and Management, Mechanical Construction Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscemc.htm

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, multi-disciplinary, 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.

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. On 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsenve.htm

Educational Objectives in Environmental Engineering

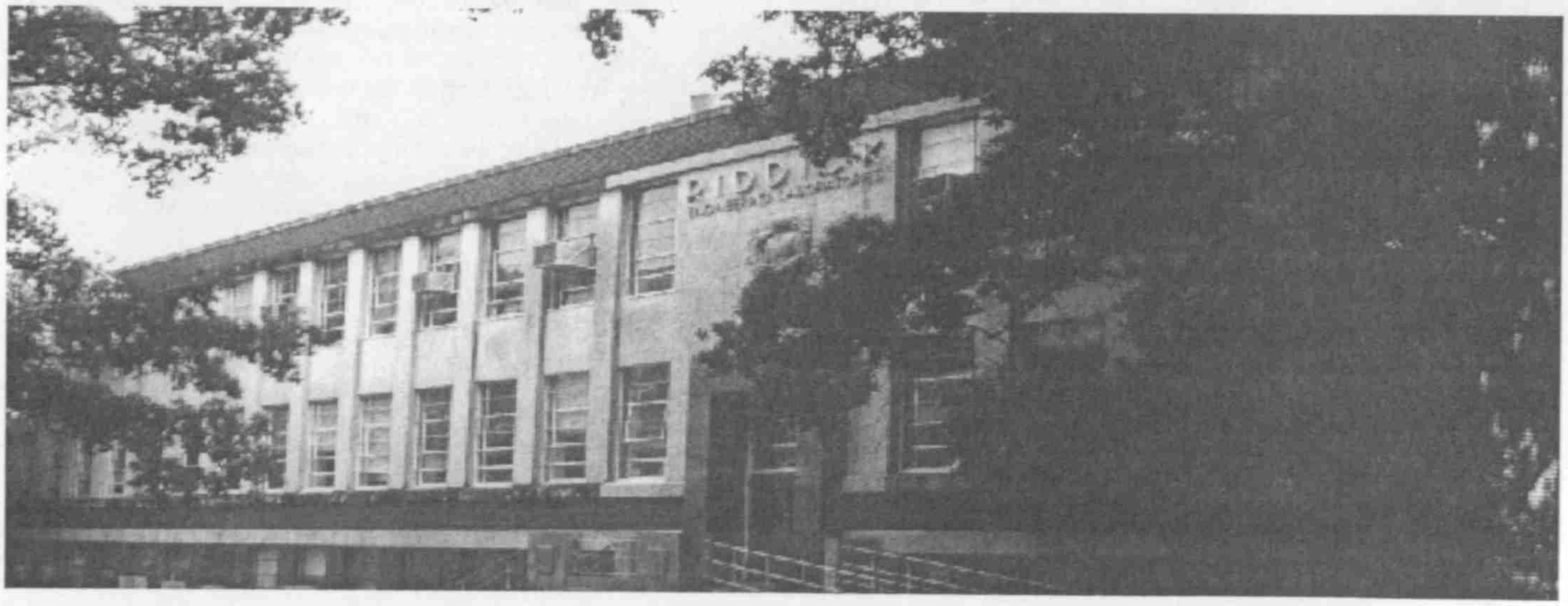
- To prepare students for entry into successful careers in Environmental Engineering, emphasizing the mastery of environmental science and engineering fundamentals, the ability to solve engineering problems, the importance of engineering judgment and the creative process of engineering design.
- To introduce students to engineering practices for the management and protection of air, water, and terrestrial environments and the protection of human health, and to encourage students to develop an understanding of the overall significance of both scientific and policy issues as they relate to the environment.
- 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 prepare students to function in cross-disciplinary, team-oriented, open-ended activities.
- To prepare broadly educated engineers with: an ability to communicate effectively; an understanding of the need for life-long learning; and an appreciation for the arts, humanities, and social sciences.
- To expose students to the role of research in environmental engineering and to prepare students 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, 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

Withers Hall, Rooms 208 and 226
Phone: 919/515.2858

A. L. Tharp, *Head*
E. W. Davis, Jr., *Director of Graduate Programs*
R. J. Fornaro, *Director of Undergraduate Programs*
J. Hatch, *Coordinator of Advising*
D. A. Lasher, *Director of Student Services*
D. J. Thuente, *Assistant Head*

Distinguished University Research Professor: D.L. Bitzer; *Alumni Distinguished Undergraduate Professor*: A.L. Tharp; *Emeritus Professor*: D.C. Martin, W.E. Robbins, K.C. Tai; *Professors*: D.L. Bitzer, W. Chou, E.W. Davis, Jr., J. Doyle, R.J. Fornaro, R.E. Funderlick, D.F. McAlister, H.G. Perros, D.S. Reeves, R.D. Rodman, G.N. Rouskas, C.D. Savage, W.J. Stewart, A.L. Tharp, M.A. Vouk; *Associate Professors*: D.R. Bahler, E.F. Gehringer, T.L. Honeycutt, S.P. Iyer, J.C. Lester, I. Rhee, M.P. Singh, R. St. Amant, M.F. Stallmann, D.J. Thuente; *Assistant Professors*: A.I. Anton, R.Y. Chirkova, R. Dutta, K. Hartoush, C.G. Healey, F. Mueller, P. Neng, L.A. Williams, P.R. Wurman, R.M. Young; *Visiting Research Professor*: F. Brglez; *Adjunct Professors*: W.R. Cleveland, II, R.J. Plemmons; *Adjunct Assistant Professors*: M. Aparicio, IV, G.Q. Kenney, A. Rindos, M. Singh; *Lecturers*: S. Balik, J. Hatch, D.A. Lasher, C.S. Miller, T.E. Nelson, J. Schwarz; *Adjunct Lecturers*: D. Duvarney, S. Hunter, M. Izquierdo, T. Jepsen, D. Pase, J. Perry, D. Strickland, T. Tolle, H. Williams, L. Xu, A. Zaghloul; *Director of Multimedia Lab*: D.H. Kekas; *Research Assistants*: J.C. Bass, J.E. Robinson; *Associate Members of the Department*: J.W. Baugh, Jr. (Civil Engineering), E. Kaltofen (Mathematics), G. Lazzi (Electrical and Computer Engineering), C.D. Meyer, Jr. (Mathematics), J.S. Scoggs (Mathematics), W.E. Snyder (Electrical and Computer Engineering), I. Viniotis (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 your ambitions and preferences, 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. This 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.

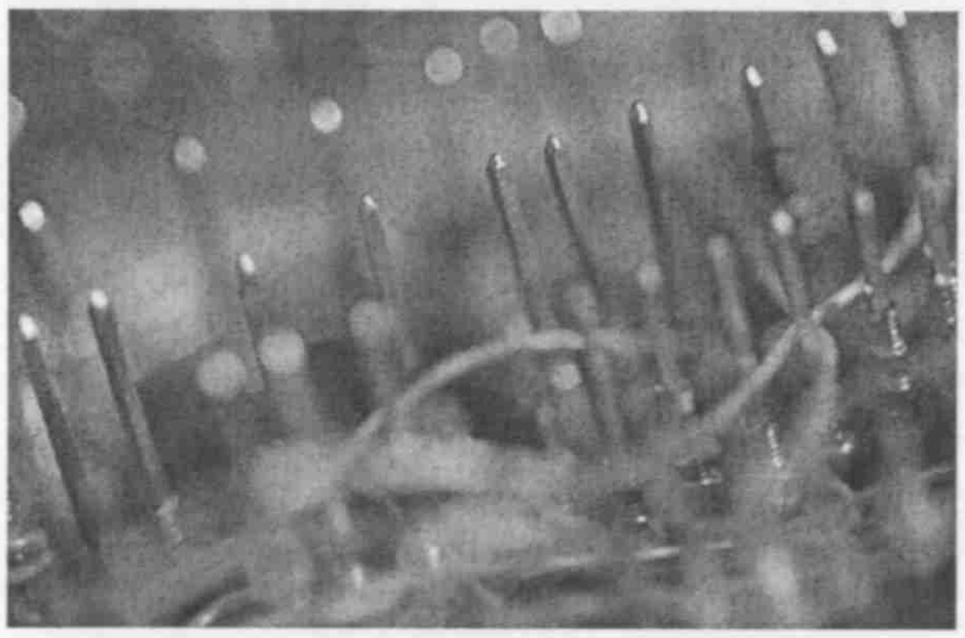
Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscpsc.htm

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Daniels Hall, Room 232
Phone: 919/515.2336

J. J. Grainger, *Interim Head*
J. J. Brickley, Jr., *Associate Head*
W. E. Alexander, *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; *Alton and Mildred Lancaster Distinguished Professor of Electrical and Computer Engineering*: R.J. Trew; *Professors*: W.E. Alexander, B.J. Baliga, S.M. Bedair, G.L. Bilbro, M.Y. Chow, T.M. Conte, P.D. Franzon, J.J. Grainger, J.R. Hauser, B.L. Hughes, G.J. Lafrate, K.W. Kim, R.M. Kolbas, W.T. Liu, T.K. Miller, H.T. Nagle, A.A. Nilson, C.M. Osburn, M.C. Ozturk, S.A. Rajala, W.E. Snyder, M.B. Steer, J.K. Townsend, R.J. Trew, H.J. Trussell; *Professors Emeriti*: T.H. Gilsson, A.J. Goetze, J.F. Kauffman, M.A. Littlejohn, L.K. Monteith, J.B. O'Neal, Jr., A. Reismann, D.R. Rhodes, J.J. Wortman; *Associate Professors*: S.T. Alexander, M.E. Baran, M. Devetsikiotis, A. Duel-Hallen, E.F. Gehringer, E. Grant, A.H. Krim, D.S. Reeves, I. Viniotis, M.W. White; *Associate Professor Emeritus*: W.T. Easter; *Assistant Professors*: D. W. Barlage, G.T. Byrd, H. Dai, W.R. Davis, A.G. Dean, G. Lazzi, V. Misra, J.F. Muth, E. Rotenburg, M. Sichitu, Y. Solihin, W. Wang, Z. Zhang; *Visiting Professor*: J.W. Mink, *Visiting Associate Professor*: J.J. Brickely, Jr.; *Visiting Assistant Professors*: R.T. Kuehn, H.O. Ozturk, S.J. Walsh, D.G. Yu; *Visiting Research Professor*: C.R. Guarnieri, W.C. Holton; *Research Assistant Professor*: A.A. Kiselev; *Visiting Instructor*: C.W. Townsend; *Lecturer*: B.J. Greene; *Adjunct Professor*: R.K. Cavin, J. Chang, M. Dutta, R.C. Luo, W.T. Lynch, R. Singleton, M.A. Stroscio, R.J. Ultman, J.M. Zavada; *Adjunct Associate Professor*: D.J. Bradley, J.D. Brock, J.R. Burke, C.S. Gloster, R.S. Gyurcsik, D.J. Herr, S.S. Lee, H.Z. Massoud, A.S. Mortazawi, N.C. Strole, D. Temple, D.L. Woolard; *Adjunct Assistant Professor*: D.J. Bradley, J.D. Brock, J.R. Burke, C.S. Gloster, R.S. Gyurcsik, D.J. Herr, S.S. Lee, H.Z. Massoud, A.S. Mortazawi, N.C. Strole, D. Temple, D.L. Woolard; *Adjunct Assistant Professor*: T.M. Bradicich, W.J. Chimiak, W.E. Cohen, J.M. Conrad, D.L. Dreifus, R.J. Evans, E.W. Fulp, M.D. Gerhold, M.J. Gorman, D.W. Hislop, F.Y. Jou, A.W. Kelley, P.K. McLarty, K.J. Molnar, A.S. Morris, A.J. Montalvo, D. Novosel, R.O. Onvural, S.D. Rampal, A.J. Rindos, P. Satago, J.C. Sutton, E.M. Vogel, C.K. Williams, A.J. Yezzi, M. Yousif; *Adjunct Lecturer*: H.C. Cranford, C.A. Sastre, J.P. Streck; *Interinstitutional Adjunct*: J.H. Kim, R.Z. Makki, F.M. Tranjan, R. Tsu; *Laboratory Supervisor*: J.N. O'Sullivan, *Associate Members of the Department*: D. Bitzer (Computer Science), S. Blanchard (BME), 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. Schetzina (Physics), 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).

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 eight endowed scholarships which are usually awarded to juniors and seniors: Elizabeth P. Cockrell, L. A. Mahler, Amelia N. Mitta, Frank T. Pankotay, William DeRosset Scott III, E. Chester Seewald, 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 the Alcoa Foundation, Fujitsu, Lockheed Martin, Nortel, and the United Technologies Research Center. Academic merit is generally the primarily 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 Eos System, a network of state-of-the-art engineering workstations, provides a powerful computing environment available to all students. An Eos laboratory suite with more than sixty workstations is located within the department. The department provides knowledgeable lab operators for this facility throughout the week. A student may log in at over 500 workstations located in this lab and several other facilities throughout the College of Engineering. Powerful software is provided on the system for engineering analysis, design and testing, symbolic mathematics, sophisticated color graphics, scientific spreadsheets, programming languages, work processing, document formatting and other special applications. Some of this industry-standard software is not available on personal computers. The department has the William F. Troxler Design Center which provides resources for many required industry-sponsored, semester-long design projects. Weekly sessions are scheduled in the Undergraduate Teaching Center by teaching assistants to answer student questions about course material.

CORE COURSES

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Most 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, 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 six 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 at the following addresses:

Curriculum in Computer Engineering, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscpeg.htm
Curriculum in Electrical Engineering, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bseleg.htm
Curriculum, B.S. Computer Engineering, M.S. Computer Engineering
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscpemscpe.htm
Curriculum, B.S. Computer Engineering, M.S. Management
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bscpemsman.htm
Curriculum, B.S. Electrical Engineering, M.S. Electrical Engineering
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bseemsee.htm
Curriculum, B.S. in Electrical Engineering, M.S. Management
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bseemsm.htm

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, 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 by the student's advisory committee and the Dean of Engineering. For information, contact the Assistant Dean for Academic Affairs at 919/515.2315.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bs-eng.htm

MECHATRONICS CONCENTRATION IN ENGINEERING

Degree Offered: B.S. in Engineering

This degree offers students a multi-disciplinary education in design and product development processes. The curriculum integrates the classical fields of mechanical engineering, electrical engineering, computer science, and computer engineering. This multi-disciplinary field of study is known today as "Mechatronics" and instills the basic principles needed to design and build intelligent systems or products that exhibit automated, precise performance. The design of these modern mechanical systems is characterized by the integration and extensive use of sensors, actuators, optics, microelectronics and computers. The spectrum of application includes numerically controlled machines, robotics, engine and motor control systems, and microelectromechanical devices, to name but a few. Design considerations within the curriculum address aspects of system reliability and efficiency, in addition to function. The Mechatronics concentration for the curriculum supports the "synergistic integration of precision mechanical engineering, electronics control, and systems thinking into the design of intelligent products and processes." Students enrolled in the BSE-Mechatronics Concentration are resident at UNC-Asheville in Asheville, NC. The degree is granted by NC State.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/mechatr.htm

NUCLEAR POWER CONCENTRATION IN ENGINEERING

Degree Offered: B.S. in Engineering

The purpose of the B.S. in Engineering degree with a concentration in nuclear power engineering is to provide the opportunity for employees at nuclear power plants to earn an engineering degree while still continuing full time employment. Earning such a degree will enhance the employee's performance in their current positions, and provide an opportunity for professional advancement. These attributes will benefit both the employee and the employer. It is offered as an off-site degree program, with reliance on transfer credits from mainly community colleges to meet general education requirements of North Carolina State University. To be implemented, it requires both the financial and logistic support of the student's employer. Nuclear engineering is concerned with the engineering aspects of the control, release, and utilization of nuclear energy generated from fission. The concentration in nuclear power engineering program educates individuals in scientific and engineering principles essential for effective and productive contributions in industrial, university, and government service. This degree meets all requirements of the University of North Carolina System under the accreditation of the Southern Association of Colleges and Schools; however note that its curriculum does not conform to the requirements of the Engineering Accreditation Commission of the Accreditation Board the Engineering and Technology (ABET). This program is closed to new enrollment.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/nucpowrcur.htm

DEPARTMENT OF INDUSTRIAL ENGINEERING

Riddick Engineering Laboratories, Room 328
Phone: 919/515.2362
www.ie.ncsu.edu

J. R. Wilson, *Head*
C. L. Smith, *Assistant Head and Director of Undergraduate Programs*
S. C. Fang, *Director of Graduate Programs*
H. L. W. Nuttle, *Associate Director of Graduate Programs*

Henry A. Foscue Professor: C.T. Culbreath; *University Professor*: S.E. Elmaghraby; *Walter Clark Professor*: S.C. Fang; *James T. Ryan Professors*: T.J. Hodgson; *Professors*: M.A. Ayoub, R.H. Bernard, X. Chao, Y. Fathi, R.E. King, W.L. Meier, H.L.W. Nuttle, S.D. Roberts, J.R. Wilson, R.E. Young; *Professors Emeriti*: R.E. Alvarez, C.A. Anderson, J.R. Canada, R.G. Pearson, A.L. Prack, W.A. Smith, Jr.; *Associate Professors*: D.R. Cormier, D.B. Kaber, M.G. Kay, Y.S. Lee, G.A. Mirka, E.T. Sanii; *Assistant Professor*: O.L.A. Harrysson; *Lecturer*: C.S. Alderman, C.L. Smith.

The Department of Industrial Engineering offers an undergraduate BS 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; telephone: 410/347.7700.

Specific curriculum requirements are available at the following address:

Curriculum in Industrial Engineering
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsineg.htm
Curriculum in Industrial Engineering, Furniture Manufacturing
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsiefm.htm

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, 319-A Riddick Engineering Laboratories, 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 331-A Riddick Engineering Laboratories 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, 319-A Riddick Engineering Laboratories, 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 331-A Ridding Engineering Laboratories 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 BS or combined BS-MIE/MSIE, ABET and University requirements will be satisfied based upon the four (4) year curriculum.

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Ridding Engineering Laboratories, Room 229
Phone: 919/515.2377

J. M. Rigsbee, *Head*
C. C. Koch, *Associate Head*
R. O. Scattergood, *Director of Graduate Programs*
C. M. Balik, *Director of Undergraduate Programs*

Kobe Steel Professor: R.F. Davis; *Distinguished Research Professors*: J.J. Cuomo, J. Narayna; *Professors*: K. Bachmann, R.B. Benson, Jr., J.J. Hren, 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. Spontak; *Associate Professors*: C.M. Balik, D.W. Brenner, J. Kasichainula; *Assistant Professors*: G. Duscher, M. Johnson, J.P. Maria; *Professors Emeriti*: W.W. Austin, H. Conrad, A.A. Fahmy, K.L. Moazed, H. Palmour III, H.H. Stadelmaier, R.F. Stoops; *Associate Professor Emeritis*: J. Hamme; *Visiting Professor*: K. Dawes; *Visiting Associate Professor*: D. Griffis; *Senior Lecturers*: Y. Fahmy, T.M. Hare; *Adjunct Professors*: O. Auciello, G.L. Doll, J.T. Glass, J.T. Prater, R. Reeber, J. Russ, F. Shimura; *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 this 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 21202-4012; phone: 410/347.7700.

The educational objectives of the Materials Science and Engineering curriculum are:

- To produce graduates who are able to apply the principles of mathematics, science, and engineering, so they are prepared for entry-level engineering jobs or graduate school.
- To produce graduates who are knowledgeable about a variety of engineering materials (including metals, semiconductors, ceramics, polymers, and composites), and the relationships among processing, structure, properties, and performance.
- To produce graduates who are able to define and solve problems, especially those involving materials selection and design, and are capable of developing, implementing and evaluation solutions via integration of their basic scientific skills and knowledge.
- To produce graduates who are able to communicate effectively and who demonstrate the ability to function on multi-disciplinary teams.
- To produce graduates who are skilled at using modern engineering tools for analysis, design, and communication.
- To produce graduates who are able to understand their responsibility to their profession and society in a global context and who are prepared for and realize the importance of life-long learning.

Graduates of the Department of Materials Science and Engineering will be prepared to define and solve engineering problems through the application of modern engineering tools and basic principles of mathematics, science, and engineering. Graduates will be knowledgeable about all types of engineering materials and able to communicate effectively and function in interdisciplinary teams. Graduates will operate with a clear understanding of professional ethics and will recognize the global context of their jobs and the importance of lifelong learning.

OPPORTUNITIES

The continuing industrial and technological growth of the United States, the general southeast, 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, 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 one technical elective dealing with processing (metallic, ceramic, polymeric or semiconducting materials) and one technical elective dealing with specific applications (composite materials or electronic materials). The basic science elective allows students to gain more fundamental knowledge in either solid-state theory, organic, or physical chemistry. The required senior design courses (MAT 423-424) serve as capstone courses and provide a strong preparation for dealing with real industrial situations. MAT 423 covers open-ended classroom exercises and involvement in group dynamics and proposal preparation. MAT 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. A fifth year professional program is available for the advanced study and further specialization. Graduate degrees are also offered (consult the *Graduate Catalog*).

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsmats.htm

MINOR IN MATERIALS SCIENCE AND ENGINEERING

The Minor in Materials Science and Engineering provides a fundamental understanding of materials to non-MSE undergraduate engineering students (mechanical engineers, electrical engineers, etc.) and other science majors. The Minor in Materials Science and Engineering offers a concentration in basic principles and a choice of specific areas of interest including ceramic, polymeric, metallic, or electronic materials. This minor requires 17-19 hours of concentration including MAT 201 and MAT 210. The GPA for Minor courses must be at least a 2.0. Further 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

M. N. Noori, *Head*
R. R. Johnson, *Associate Head*
R. D. Gould, *Director of Graduate Program*

Alumni Distinguished Undergraduate Professors: E.M. Afify, M.A. Boles, R.R. Johnson; *Alumni Distinguished Graduate Professors*: F.R. DeJarnette, H.A. Hassan; *Professors*: N. Chokani, T.A. Dow, R.F. Keltie, C. Kleinstreuer, D.S. McRae, R.T. Nagel, M.N. Noori, P.I. Ro, L.M. Silverberg, J.S. Strenkowski, F.G. Yuan, M.A. Zikry; *Professor and Senior Extension Specialist*: H.M. Eckerlin; *Adjunct Professors*: J.P. Archie; *Professors Emeriti*: J.A. Bailey, M.H. Clayton, J.A. Edwards, F.J. Hale, F.D. Hart, T.H. Hodgson, E.G. Humphries, C.J. Maday, J.C. Mulligan, M.N. Ozisik, L.H. Royser, F.O. Smetana, F.Y. Sorrell, J.K. Whitfield, C.F. Zorowski; *Associate Professors*: J.R. Edwards, Jr., J.W. Eischen, C.E. Hall, Jr., R.R. Johnson, E.C. Klang, A.V. Kuznetsov, J.W. Leach, K.M. Lyons, M.K. Ramasubramanian, W.L. Roberts, IV, S. Seelecke; *Adjunct Associate Professors*: J.H. Hebrank; *Visiting Associate Professors*: P.B. Corson; *Assistant Professors*: G.D. Buckner, T. Echekki, A. Gopalarathnam, N. Ma, K.J. Peters, A. Rabiei, T. Zeng, F. Wu; *Adjunct Assistant Professors*: A.O. Hobbs, M.M. Nazemi; *Visiting Assistant Professors*: J.Gregory; *Lecturers*: H. Davoodi, M.L. Gonzalez, S.N. Heinzen, C.M. Tran.

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 practical application of mechanical and thermal sciences to research, design, 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 Min-Baja, Formula Cars, and walking machines.

Aerospace: The 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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bsaero.htm

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 UNIX and Windows NT platforms. Computational software available includes mathematical and solution algorithms, as well as modern design and analysis tools. The experimental laboratories include measurements and data analysis, performance evaluation of thermal systems and power plants, and testing and analysis of mechanical components. The senior design laboratory jointly supported by the department and industry. This is a unique laboratory facility, which is the involvement of 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).

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/mech99.htm

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 educate students to define, formulate, and solve complete 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 related industries and industries with similar interests such as automobile design. Aerospace Engineering graduates are typical employed by government laboratories such as NASA, NAVAIR, and the Air Force, a wide variety of aerospace industries, or they 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 range of employment opportunities. The program provides students with the knowledge and experience that equips them to enter a wide range 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 one department. They are nearly the same for the freshman and sophomore years but quite different in 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 character. In addition the programs provide students with an opportunity to develop the skills for applying their acquired knowledge. The aerospace engineering and the mechanical engineering programs, which are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Bachelor of Science in Mechanical Engineering, respectively. Graduate degrees are also offered (consult the *Graduate Catalog*).

EDUCATIONAL OBJECTIVES

The objectives of the mechanical and aerospace engineering degree programs are:

- 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 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.

DEPARTMENT OF NUCLEAR ENGINEERING

Burlington Engineering Laboratories, Room 110
Phone: 919/515.2301
www.ne.ncsu.edu

P. J. Turinsky, *Head*
M. A. Bourham, *Undergraduate Administrator*
M. S. Yim, *Director of Graduate Programs*

Professors: M.A. Bourham, R.P. Gardner, J.G. Gilligan, C.W. Mayo, K.L. Murty, 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, B. Wieland, M.S. Wechsler; *Associate Professors*: J.M. Doster, M.S. Yim; *Assistant Professors*: D. Anistratov, O.E. Hankins; *Associate Professor and Director of Nuclear Reactor Programs*: A.I. Hawari; *Health Physicist*: G.D. Wicks; *Nuclear Services Manager*: S. Lassell.

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 rank as 4 of 8 in all nuclear engineering programs.

OPPORTUNITIES

Nuclear power reactor construction 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 breeder 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 three best compensated of the engineering disciplines.

SCHOLARSHIPS AND AWARDS

Several special scholarships exist for NC State nuclear engineering students, including the Bechtel, Progress Energy, Duke Energy, Eastern Carolinas ANS, Piedmont ANS, Institute for Nuclear Power Operations, 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; the Scaled Pressurized Water Reactor facility (SPWR), an operating 1/9 scale mode of a nuclear power plant; radiation detectors and multi-channel analyzers; nuclear materials laboratory; thermal hydraulic laboratory; prompt gamma facility; neutron radiography unit; numerous computer facilities including graphic terminals, numerous departmental computer workstations, several College of Engineering EOS engineering workstations, and microcomputers; plasma generation and diagnostics laboratory, plasma science laboratory, and plasma launchers laboratory; neutron activation analysis laboratory, high- and low-level radio-chemistry laboratories; reactor simulation 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 Nuclear Engineering Department's mission, the Department of Nuclear Engineering has developed the following objectives for undergraduate education.

1. 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.
2. 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.
3. To establish an educational environment in which students participate in cross-disciplinary activities.
4. 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, and a desire to seek out further educational opportunities.
5. To expose students to advances in engineering practice and research and to prepare them for opportunities in graduate and professional education.
6. 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 the senior nuclear 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 BS/MNE professional program or BS/MS combined 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 at the following address:

Curriculum in Nuclear Engineering, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/nucpowrcur.html
Curriculum in Nuclear Power Engineering
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/nucpowrcur.html

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*
H. S. Freeman, *Associate Head, Director of Graduate Programs*

(For a list of Faculty, See College of Textiles, Department of Textile Engineering, Chemistry and Science)

The textile and related industries represent a major part of the manufacturing segment of the American economy with the industry mainly concentrated in the Southeast. The textile industry of North Carolina comprises approximately one-fourth of the United States textile industry. Textile and related industries in North Carolina represent $100million of payroll per week. Nationally, the number jumps to $550 million per week.

The textile industry is rapidly changing to become a capital intensive, high-technology industry. Applications of computers and robotics technology are commonplace in the modern textile manufacturing plant. Textile engineering is concerned with the application of scientific principles and engineering practice to the design and control of all aspects of fiber, textile and apparel processes, products and machinery.

The Textile 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 Textile Engineering.

FACILITIES AND SCHOLARSHIPS

See College of Textiles

OPPORTUNITIES

The TE program offers each student a solid engineering education upon which one can build a successful professional career in a wide range of professional job functions. These include Information Systems Engineer, Machine Designer, Product Design Engineer, Chemical Process Engineer, R&D Engineer, Technical Management, Plant Engineering, Industrial Engineering, Technical Sales, Consulting and others. Textile engineers are employed in a wide variety of industries that include aerospace, automotive, chemical, composites, management consulting, fiber processing, medical devices, and textile processing.

The Textile Engineering Program provides a fundamental engineering degree with a working knowledge of the very large textile industry as well as its allied industries. Our program is designed to graduate approximately 35 students per year; therefore, we have small classes that allow you to receive individual attention to help you reach your maximum potential. We have our own career placement center to assist students in identifying and selecting jobs. 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 in California, the automotive industry in Michigan, the aerospace industry in Texas, as well as the specialty fabrics industry in Maryland.

CURRICULUM

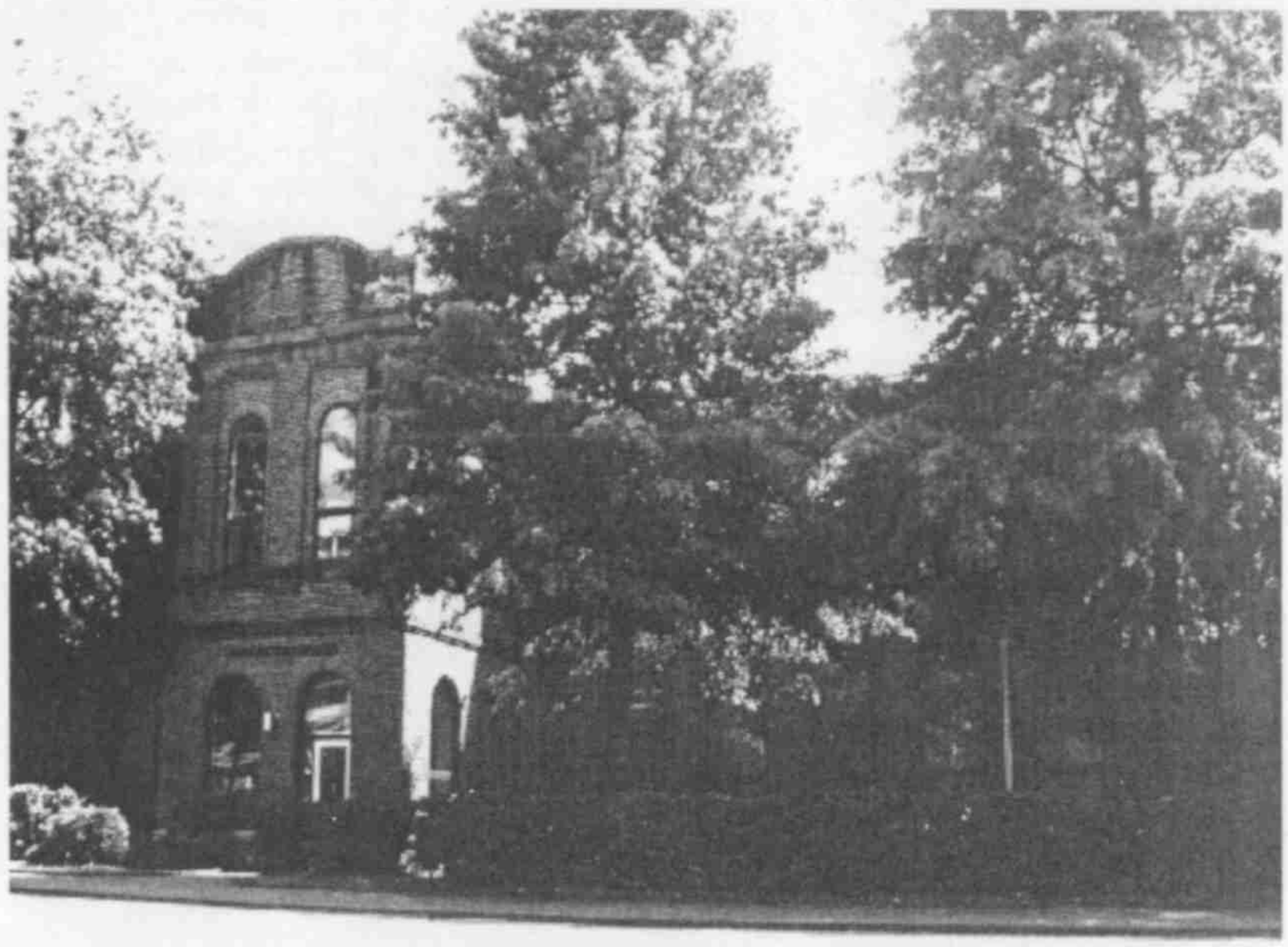
The TE program has four curriculum tracks to allow you to tailor a program that fits your specific educational goals. The tracks emphasize Information Systems Engineering, Chemical Process Engineer, Machine Design Engineering, and Product Design Engineering. Students in the Information Systems Engineering track take Computer Science and Industrial Engineering classes to supplement the core TE classes while students in the Machine Design track take Materials Engineering classes. Minors in the associated engineering fields are strongly encouraged. Foreign language minors are also encouraged as part of your academic plan.

Students interested in receiving a Masters in Science in Management in addition to a Textile Engineering degree should consider the BSTE/MSM 5 year program. In this program, students take graduate level management classes during their senior year and continue with all management classes in their fifth year.

Specific curriculum requirements are available at the following address:

Curriculum in Textile Engineering, Chemical Processing Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/techem99.htm
Curriculum, B.S. in Textile Engineering/M.S. in Management, Chemical Processing Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/techengmsmg.html
Curriculum in Textile Engineering, Information Systems Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/teinfo99.htm
Curriculum, B.S. in Textile Engineering/M.S. in Management, Information Systems Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/bstemsm.html
Curriculum in Textile Engineering, Machine Design Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/temach99.htm
Curriculum, B.S. in Textile Engineering/M.S. in Management, Machine Design Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/teengmsmgmdc.html
Curriculum in Textile Engineering, Product Design Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/teprod99.htm
Curriculum, B.S. in Textile Engineering/M.S. in Management, Product Design Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/engineer/temspdc.htm

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES



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L. P. Brady, *Dean*
G. W. O'Brien, *Associate Dean for Academic Affairs*
M. T. Zingraff, *Associate Dean for Research and Engagement*
R. J. Thomson, *Assistant Dean and Director of Undergraduate Programs*
M. L. Vasu, *Assistant Dean for Information Technology*
L. H. Hambourger, *Director of Undergraduate Enrollment Management*
M. T. Leach, *Assistant Dean, Academic Director of Diversity Affairs*

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.

The CHASS is comprised of eight departments: Communication, English, Foreign Languages and Literatures, History, Philosophy and Religion, Political Science and Public Administration, Psychology, and Sociology and Anthropology (also a department in the College of Agriculture and Life Sciences). The Division of Multidisciplinary Studies, an academic unit responsible for interdisciplinary programs, is affiliated with the college; the division also administers the Social Work Program.

The college offers undergraduate majors in: anthropology; arts applications; communication; criminology; English; French; history; multidisciplinary studies; philosophy; political science; psychology; religious studies; science; technology and society; social work; sociology; and Spanish. In addition, special options or concentrations are available within some of the major programs: communication disorders, public and interpersonal communication, communication media, public relations, and theater (major in communication); rhetoric, writing, and language and world literature (major in English); philosophy of law (major in philosophy); American politics, international politics, law and justice, and public policy (major in political science); anthropology (major in sociology); applied anthropology (major in anthropology; and human resource development (major in psychology). A Teacher Education Option is available in English, French, Spanish, and social studies (history, political science, and sociology. Enrollments in teacher education programs may be limited.

Degrees granted include the Bachelor of Arts, Bachelor of Science, Bachelor of Social Work, Master of Arts, Master of Science, and Doctor of Philosophy, as well as professional degrees in political science and sociology.

CHASS FIRST-YEAR SEMINAR PROGRAM

Completion of a CHASS First-Year Seminar is required of all students who enter CHASS with fewer than 15 credit-hours, effective in the Fall of 2000. Students entering CHASS with 15 or more credit hours (exclusive of IB or AP credit) are not required to take a CHASS First-Year Seminar.

ACADEMIC MINORS

The College of Humanities and Social Sciences offers 35 minors (shown below). Non-Departmental Minors are also available in Physical Education and International Studies.

Anthropology	Film Studies	Psychology
Africana Studies	French	Religious Studies
Art Studies	German	Russian Studies
Chinese Studies	Health, Medicine & Society	Social Work
Classical Greek	History	Sociology
Classical Studies	Italian Studies	Spanish
Cognitive Science	Japanese	Technology & Science
Creative Writing	Journalism	Theater
Criminology	Linguistics	Women & Gender Studies
English Literature	Philosophy	World Literature

DUAL DEGREE PROGRAMS:

Jefferson Scholars in Agriculture and the Humanities
The Thomas Jefferson Scholars Program in Agriculture/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 dual degree which permits participants to have two concentrations: one in an area of agriculture/life sciences and one in an area of humanities/social sciences. The double degree program may be individually designed 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.

Each spring a number of entering freshmen are chosen to receive scholarships to participate in the Jefferson program. In addition, other qualified students may choose to pursue a dual major in agriculture/life sciences and the humanities under the Jefferson program.

Students interested in applying to the Jefferson Scholars program should contact Dr. Kenneth Esbenshade, Associate Dean, College of Agriculture and Life Sciences, Box 7642, North Carolina State University, Raleigh, NC 27695 (919/515.2615) before January 15.

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 Multidisciplinary 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 within their first semester of study in the College of Design and by the time of formal declaration of major in their second semester of study. 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. Depending on the availability of the funds, DaVinci scholars will receive scholarships toward participation in the program.

Benjamin Franklin Scholars Program
A limited number of freshmen in the College of Engineering are selected to participate in the Benjamin Franklin Scholars program. In addition to their major courses, each Benjamin Franklin Scholar develops an individualized, five-year plan of work focused on a central theme in the humanities and social sciences. Students completing the program receive a Bachelor of Science degree in an engineering discipline or computer science and a bachelor's degree in multidisciplinary studies.

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 the broad philosophical perspective of the humanities. The curriculum for the dual degree program has four main components: a strong general education, specially designed interdisciplinary and problem-defining courses, all technical course requirements associated with the engineering or computer science degree, and a 30-hour multidisciplinary concentration designed by students in consultation with their advisers. 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 the Assistant Dean for Undergraduate Affairs, College of Humanities and Social Sciences, 106 Caldwell Hall.

Alexander Hamilton Scholars Program
The Alexander Hamilton Scholars Program permits students to earn a B.A. in Multidisciplinary Studies emphasizing international studies and a B.S. in Accounting, a B.S. in Business Management, or a B.A. in Economics. The B.A. in Multidisciplinary Studies is a specially designed program focusing on a specific region of the world and one of its major languages. Students may choose from the following regions: China or Japan and the Pacific Rim, France or Germany and Western Europe, Francophonic Africa, Latin America, and the Middle East.

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, at least two courses in history, political science, literature, or anthropology directed specifically at the region of study, 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 field experience lasting a minimum of six weeks which will provide immersion in the language and culture of the student's focus region.

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 the Assistant Dean for Undergraduate Academic Affairs, College of Humanities and Social Sciences, 106 Caldwell Hall.

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 multidisciplinary studies. Included in this major are two core requirements: MDS 340 Perspectives in Agricultural History (3 credits) and MDS 498 Senior Thesis (3 credits). Participants also complete an additional MDS 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 multidisciplinary 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 Multi-disciplinary 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 Multidisciplinary Studies with a concentration in international studies. This dual degree is designed to prepare students for work in the increasingly international 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 four to five years to complete, 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. Helmut Hergeth, Textile Management and Technology, 3318 Textile Building (919/515.6574) or the Assistant Dean for Undergraduate Affairs, College of Humanities and Social Sciences, 106 Caldwell Hall, 919/515.2468.

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 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, 212 Peele Hall, or at 919/515.4425.

HONORS PROGRAMS

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 need-based and non-need scholarships.

For further information contact Lynda Hambourger, Coordinator of Scholarships, College of Humanities and Social Sciences, North Carolina State University, Box 8101, Raleigh, NC 27695-8101.

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.

CURRICULA

Specific curriculum requirements for CHASS general education are available at the following address:

Bachelor of Arts Program
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bachas.htm
Bachelor of Science Program
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bschas/htm

DEPARTMENT OF ENGLISH

Tompkins Hall, Rooms 221, 246
Phone: 919/515.3866

M. H. Thuente, *Head*
L. Severin, *Associate Head, Coordinator of Advising*
B. M. Blackley, *Assistant Head for Scheduling*
J. Morillo, *Director of Graduate Programs*
N. Penrose, *Director of First-Year Writing Program*

William C. Friday Distinguished Professor: W.A. Wolfram; *Alumni Distinguished Undergraduate Professor*: M.T. Hester, A. Davis-Gardner; *Professors*: C. Anson, B.J. Baines, J. Balaban, J.W. Clark, J.Ferster, J.A. Gomez, J.M. Grimwood, A.H. Harrison, D. Herman, M.T. Hester, J.J. Kessel, T. Lisk, L.H. MacKethan, C.R. Miller, J.O. Pettis, C.A. Prioli, A.F. Stein, M.H. Thuente, J.N. Wall Jr., W. Wolfram, R.V. Young; *Professors Emeriti*: G.W. Barrax, P.E. Blank Jr., L.S. Champion, J.D. Durant, M. Halperen, L.T. Holley, H.G. Kincheloe, A.S. Knowles, B.G. Koonce, F.H. Moore, J.J. Smoot, M.C. Williams, P. Williams Jr.; *Associate Professors*: W. Barnhardt, M.P. Carter, D.H. Covington, A.M. Davis-Gardner, C. Gross, N. Halpern, S.B. Katz, S.M. Katz, R.C. Kochersberger, D.L. Laryea, L. May, J.D. Morillo, C. Nwankwo, M.E. Orr, A.M. Penrose, M. Pramaggiore, S. Setzer, L.R. Severin, K. Shepherd-Barr, S. Smith-McKay, E. Thomas, J.F. Thompson, H.C. West, D.B. Wyrick; *Assistant Professors*: A. Baker, A. Bolonyai, C.J. Cobb, S. Dicks, E.A. Hariston, P. LaCoste-Lynn, D. Orgerou, M. Orgerou, D. Rieder, J. Swartz, C. Warren; *Senior Lecturer*: P.R. Cockshutt, D.B. Jones.

The Department of English offers basic and advanced courses in writing, language, and literature. The freshmen course required of all undergraduate student 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 five options: language and literature; creative writing; world literature; rhetoric, writing, and language; 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.

In addition, the department offers two graduate degrees: a Master of Arts in English and a Master of Science in Technical Communication. (See Graduate Catalog for details.) 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 3.0 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 3.4 in NC State English courses and a minimum overall GPA of 3.25.

Bachelor of Arts in English
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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/baenglish.html

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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/baengcw.html

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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/baworldlit.html

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 focuses distribution of courses specially designed for LWR majors.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/baenglwr.html

Major in English, Concentration in Teacher Education- 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. Enrollments in the Teacher Education Option may be limited.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/engtched.htm

Bachelor of Science in English
Major 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bsenglish.htm

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 English Department for NC State students, except LCW English majors.

Minor in English
The English Department 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, Foreign Languages and Literatures, and the Division of Multidisciplinary Studies 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 English Department 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. World Literature courses are cross-listed in the Department of English and the Department of Foreign Languages and Literatures.

DEPARTMENT OF FOREIGN LANGUAGES AND LITERATURE

1911 Building, Room 117
Phone: 919/515.2475

R. Gross, *Head*
D. M. Marchi, *Assistant Head*
A. B. Kennedy, *Coordinator of Advising*

Professors: T.P. Feeny, Y.B. Rollins, M.L. Sosower, M.A. Witt; *Professors Emeriti*: M. Paschal, R. Kelly, E.M. Stack; *Associate Professors*: V. Bilenkin, H.G. Braunbeck, G.A. Dawes, M.M. Magill, A.C. Malinowski, D.M. Marchi, J.P. Mertz, M.L. Salstad; *Associate Professors Emeriti*: R.A. Alder, V.M. Prichard, S.E. Simonsen, H.Tucker Jr.; *Assistant Professors*: L.M. Barovero, M.L. Darhower, J.S. Despain, H.A. Jaimes, J. Mari, E. Tai, E.L. Vilches; *Lecturers*: D.F. Adler, T.P. Brody, A.B. Kennedy, S. Navey-Davis, H. 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 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, including a senior seminar/capstone course. Majors must take 12 additional hours of advised electives. These are waived for students who choose to double major (in Business Management or Political Science, for example), 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 French and Spanish beyond the 102 level. 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 of 3.0+ and a departmental SGPA 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.

Students will extend their critical thinking skills, refine foreign languages skills, and discover significant scholarly areas of particular interest to them through various avenues, such as: Honors options in regular classes, in which students explore the material in greater depth or breadth; development and execution of an independent project, assisted by a faculty mentor and; an approved study abroad project. Completion of departmental Honors is noted on the student's transcript and at Commencement.

PROGRAMS ABROAD

Summer study programs are offered in France, India, Mexico, Spain, and Peru.

MINORS IN FOREIGN LANGUAGES, 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, French, German, Italian, Russian, Spanish, and Classical Studies.

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 ESL 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.

DEPARTMENT OF HISTORY

Harrelson Hall, Room 162
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*
A. W. Mitchell, *Director of Graduate Programs*
D. P. Gilmartin, *Director of the Honors Program*
J. D. Smith, *Director of the Public History Program*

Professors: J.R. Banker, C.H. Carlton, A.J. DeGrand, D.P. Gilmartin, W.C. Harris, O.J. Kalinga, A.J. LaVopa, J.K. Ocko, S.T. Parker, R.S. Sack, R.W. Slatta, E.D. Sylla, K.S. Vincent; *Alumni Distinguished Undergraduate Professor*: J.M. Riddle; *Graduate Alumni Distinguished Professor*: J.D. Smith; *Associate Professors*: R.S. Bassett, H. Brewer, J.E. Crisp, A.F. Khater, W.A. Jackson, M.G. Kim, W.C. Kimler, K.P. Luria, S. Middleton, A.W. Mitchell, S.L. Spencer, G. Surh, P. Tyler, K.P. Vickery, D.A. Zonderman; *Assistant Professors*: M. Allen, D.R. Ambaras, B.M. Kelley; *Adjunct Professor*: J. Crow; *Adjunct Assistant Professors*: W. Atkins, V.L. Berger, J. Caddell, B. Cain, A. Daniel, J.R. Lankford Jr.; *Visiting Assistant Professor*: N. Gustke; *Professors Emeriti*: B.F. Beers, M.L. Brown, M.S. Downs, R.W. Greenlaw, J.P. Hobbs, D.E. King, L.O. McMurry, M.E. Wheeler, B.W. Wishy.

The History Department 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 US Senate. We are particularly strong in the history of race relations, law and society, and history of science and technology, but we maintain a diversity of scholarly fields and have a strong record of publications, grant and fellowship awards, and public outreach.

History melds personal experience with the 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. We provide general skills of information gathering and analysis that are 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 needed to cope with a rapidly changing work world.

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.

We encourage students to develop their own interests: our clusters focus on such topics as the History of Science and Technology and the History of Law and Society.

We offer a several undergraduate majors, a minor, the M.A. in History, and the M.A. in Public History. The departmental Honors Program provides a guided experience in independent research. Outstanding History students are eligible for membership in Phi Alpha Theta, the national history honor 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 120 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bahist.htm

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.

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.

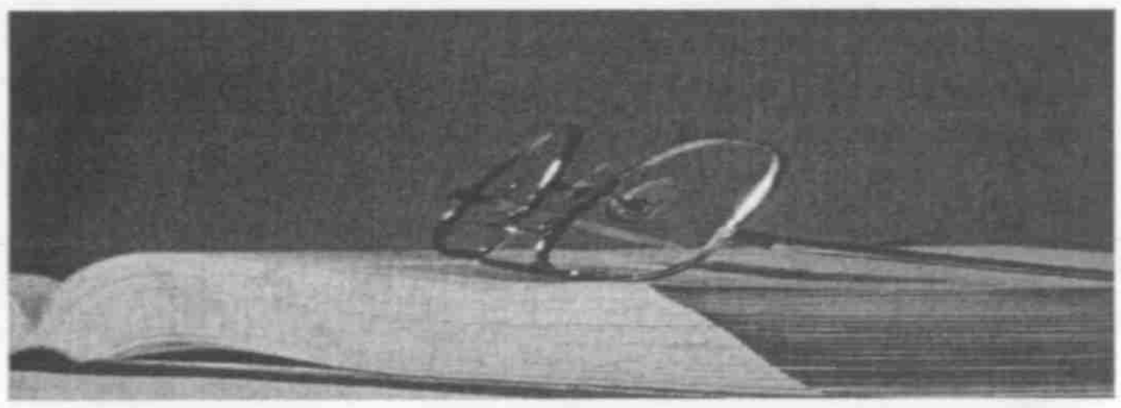
Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/his-ss.htm

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 BS 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 of engineering major.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bshist.htm

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 of 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.



DIVISION OF MULTIDISCIPLINARY STUDIES

2806 Hillsborough Street
Phone: 919/515.2470

D. B. Greene, *Head and Director of the Arts Studies Program*
P. W. Hamlett, *Assistant Head and Director of the Program of Science, Technology, and Society*

Professors: D.B. Greene, C.D. Korte, C.M. Pierce; *Professors Emeriti*: D.A. Adams, A.C. Barefoot; *Associate Professors*: C.C. Brookins, P. W. Hamlett, F.W. Hayes, J. Herkert, R.L. Hoffman, R.A. Waschka II; *Assistant Professors*: D. Crumbley, K. Harwood, M. Wyer, S. Warren; *Lecturers*: E. Malloy-Hanley.

Multidisciplinary Studies Degree Committee:
C. Crossland, *Curriculum and Instruction*
A. Kennedy, *Foreign Languages and Literatures*
D. Greene, *MDS, Chair*
E. Malloy-Hanley, *Multidisciplinary Studies*
S. Stallings, *Communication*
E. Erickson, *Economics*

Multidisciplinary Studies is an academic unit responsible for interdisciplinary programs dealing with contemporary and historical issues and problems. Courses are often taught by teams of faculty drawn from the division and from the academic disciplines relating to the problems or issues under consideration. These courses are open to all students in all curricula.

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN MULTIDISCIPLINARY STUDIES

The Multidisciplinary Studies program 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 in Multidisciplinary Studies has the responsibility of organizing a concentration or field of specialization from one or more disciplines. A concentration in Latin American Studies might, for example, combine related courses in language, literature, history, economics, sociology, and political science.

The freshman and sophomore basic requirements for the multidisciplinary studies programs 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 those courses that are most appropriate as background for the courses in their major concentrations.

To become candidates for a self-designed major in multidisciplinary studies, students must first get applications forms and information either online at www.ncsu.edu/chass/mds/mdsba.html or from the office of the Division of Multidisciplinary Studies, 2806 Hillsborough Street 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 sponsor and submitted to the Multidisciplinary Studies Degree Committee for consideration.

After a thorough examination to determine whether the set of courses proposed as a multidisciplinary major is academically sound and coherent, the committee will approve the proposal or suggest specific improvements.

BACHELOR OF ARTS IN ARTS APPLICATIONS

The Division of Multidisciplinary Studies also offers a degree program in Arts Applications, which allows students to develop a foundation in one of the arts (film, music, theater, or visual art), and on that foundation, learn the social or technological applications of the arts in a modern world. Examples are computers and the arts, scientific illustration, arts management, and arts education.

Students take 21 hours in foundation courses, 6 hours in linking courses, (such as computers and music or arts and politics), a 3 hours capstone course (MDS 494) designed for Arts Applications majors, and an advised elective to support their particular interests and career objectives. To enroll in the program, students should apply at the CHASS Dean's Office, 106 Caldwell.

BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN SCIENCE, TECHNOLOGY, AND SOCIETY

The Division of Multidisciplinary Studies also offers a BA or a BS in Science, Technology, and Society. STS is an interdisciplinary field of study that seeks to explore and understand the many ways that modern science and technology shape modern culture, values, and institutions, and how modern values shape science and technology.

Students in the BA and BS community complete an Introduction to the Field, four Advanced Courses, a four-course student-designed Specialty, and a Capstone course, along with two co-requisite courses. To apply, students should contact the Division of Multidisciplinary Studies Office, 2806 Hillsborough Street.

HONORS PROGRAM

The Honors Program in Multidisciplinary 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 MDS Honors Program, students must have earned nine credit hours in their MDS concentrations, have an overall GPA of 3.0 and a major GPA of 3.25.

To graduate with Honors in MDS, students must have a GPA of 3.25, and must have completed the MDS capstone course, "Independent Studies for MDS 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 MDS concentrations.

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 an Introduction to African-American Studies (MDS 240), Black American Literature (ENG 248), and Afro-American History (HI 372 or 373). Two elective courses may be selected from a list of designated courses in such disciplines as anthropology, history, language, sociology, social work, and communication. The minor is designed to bring together students from diverse backgrounds and curricula who share a common interest in the African American experience.

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 ENVIRONMENTAL SCIENCE

The Environmental Science Minor provides a pathway for students from all disciplines to acquire a basic understanding of their biophysical and socioeconomic environments, and the effects of humankind's activities upon these environments. With this knowledge, individuals will be better able to interpret environmental issues that emerge daily, and to influence public and private activities that affect the environment.

The minor consists of 15 credit hours of course work, selected from more than 20 eligible courses subdivided into four groups. To complete the minor, a student must take at least one course from each group, plus one additional course.

MINOR IN FILM STUDIES

(See Department of English)
The Department of English and of Communication and the Division of Multidisciplinary Studies 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), MDS 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.

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 SCIENCE, TECHNOLOGY AND SOCIETY

The Minor in Science, Technology and Society is a fifteen-hour, multidisciplinary 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 familiarity with science and technology.

MINOR IN WOMEN'S AND GENDER STUDIES

The Women's and Gender Studies Minor provides all students in the university the opportunity for interdisciplinary study in women's and gender issues from a wide variety of cultures, backgrounds, and historical eras. In addition, it introduces the often unacknowledged contributions made by women and men in various fields of endeavor through course offerings in nine departments, the undergraduate minor helps students to examine common assumptions about gender relations using feminist theory and methodologies across disciplinary boundaries.

DEPARTMENT OF PHILOSOPHY AND RELIGION

Winston Hall, Room 101
Phone: 919/515.3214

H. D. Levin, *Interim Head*
J. W. Carroll, *Assistant Head*
M. K. Cunningham, *Coordinator of Advising*

Alumni Distinguished Undergraduate Professors: W.R. Carter, M.K. Cunningham, T.H. Regan; *Professors*: W. Adler, W.R. Carter, G.L. Comstock, D.M. Jesseph, C.M. Pierce; *Professors Emeriti*: P.A. Bredenberg, R.S. Bryan, T.H. Regan, A.D. VanDeVeer; *Associate Professors*: D.F. Austin, J.W. Carroll, M.K. Cunningham, R.M. Hambourger, T.J. Hinton, B.B. Levenbook, H.D. Levin, R.O. Savage, T.K. Stewart; *Associate Professors Emeriti*: W.C. Fitzgerald, W.L. Highfill, R.S. Metzger; *Assistant Professors*: D.D. Auerbach, J.C. Bivins, M.F. Bykova, R.P. Endicott, 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.

The Department of Philosophy and Religion is located on the World Wide Web at:
www2.ncsu.edu/ncsu/chass/philo/

OPPORTUNITIES

For studies 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 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 HONORS 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, 326, 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, 460, 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 72 hours in philosophy, in addition to the three hours in philosophy required for all CHASS students, 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 275, 321, 306, 309, 311, 313, 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 275 or PHI 321, 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, 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 275, 321, 306, 309, 311, 313, 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.

MINORS

Students wishing to take any of the following academic minors need to complete the departmental form declaring intention to do so.

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 472; PS 342; PS 346; MDS. 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 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.

DEPARTMENT OF POLITICAL SCIENCE AND PUBLIC ADMINISTRATION

Caldwell Hall, Room 211
Phone: 919/515.2481

J. H. Svara, *Head*
E. O'Sullivan, *Director of Public Administration Graduate Programs*
J. O. Williams, *Director of Political Science Programs*
H. Hobbs, *Director, Master of International Studies*
S. Carey, *Coordinator 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*: C. Griffin, S.H. Kessler, R.S. Moog, E. O'Sullivan, T.V. Reid, J.E. Swiss, M.L. Vasu; *Associate Professors Emeriti*: J.H. Gilbert, H.G. Kebschull, J.M. McClain, R.F. Stephen, A.J. Taylor; *Assistant Professors*: M.D. Cobb, N. Darnall, S. Greene, F. Hayes, V.P. Munoz; *Visiting Assistant Professors*: H. Hobbs, J.R. Horner, S.K. Strauss; *Lecturers*: S.M. Carey, J.A. Delp, P.M. Pavlik.

The Department of Political Science and Public Administration 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 political science 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. The department also supports a Model United Nations team.

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 manager and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

HONORS PROGRAM

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 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 http://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:

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 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 http://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; and 4 hours of course work that develops computer competencies and orients students to the discipline of political science.

  Specific curriculum requirements are available at the following address:
  www.ncsu.edu/reg_records/ug_catalog/programs/chass/baampol.html

- **International Politics**
  This concentration develops skills that benefit students interested in graduate or professional school, careers in government service, international 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; and 4 hours of course work that develops computer competencies and orients students to the discipline of political science.

  Specific curriculum requirements are available at the following address:
  www.ncsu.edu/reg_records/ug_catalog/programs/chass/baintlpol.html

- **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; and 4 hours of course work that develops computer competencies and orients students to the discipline of political science.

  Specific curriculum requirements are available at the following address:
  www.ncsu.edu/reg_records/ug_catalog/programs/chass/balawjust.html

- **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 or core courses; 15 hours of concentration electives; and 4 hours of course work that develops computer competencies and orients students to the discipline of political science.

  Specific curriculum requirements are available at the following address:
  www.ncsu.edu/reg_records/ug_catalog/programs/chass/bapubpol.html

Social Studies Teacher Option
Students may combine the coursework for a Bachelor of Arts in Political Science with the coursework necessary to seek certification to teach at the K-12 level in the North Carolina Public School System. Major requirements are 31 hours of political science course work covering the social studies competencies established by the North Carolina Department of Public Instruction. Grades of C- or better for courses applied towards the major with a minimum GPA of 2.0 for all political science courses taken are required. For a semester-by-semester guide to the course requirements for the Social Studies Teacher Option curriculum, see the departmental website at http://www2.chass.ncsu.edu/pspa.

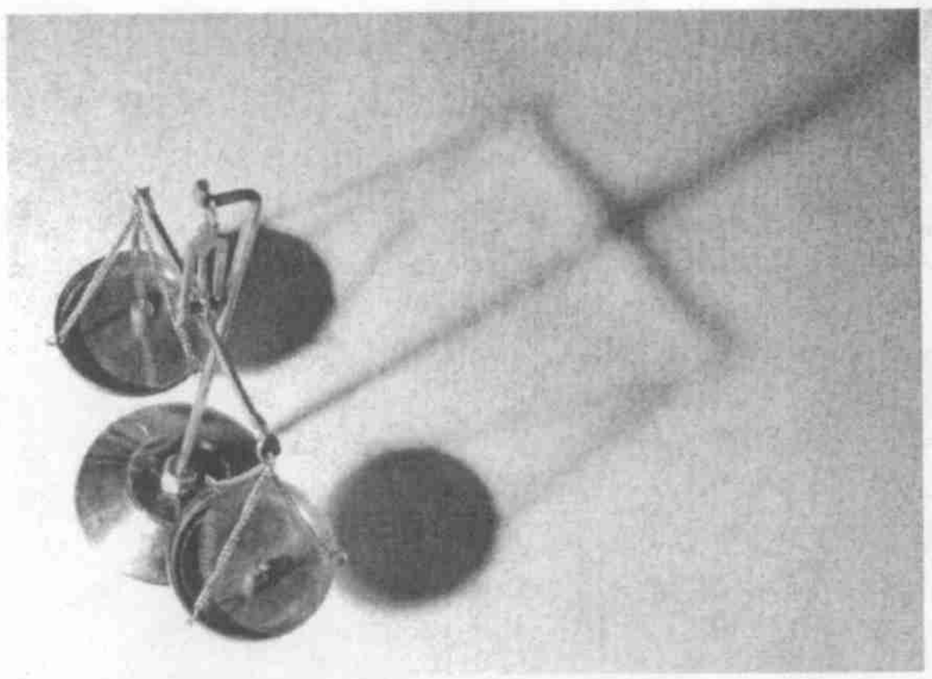
Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass.socsttchcur.hml

Bachelor of Science in Political Science
Major requirements re 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 http://www2.chass.ncsu.edu/pspa/

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bspolsc.htm

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 or 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
www2.ncsu.edu/ncsu/cep/psychology/psychology.html

D. W. Martin, *Head*
D. H. Mershon, *Associate Head*
S. A. Converse-Lane, *Assistant Head, Undergraduate Coordinator*

Alumni Distinguished Undergraduate Professors: K.W. Klein, D.H. Mershon, S.S. Snyder; *Professors*: L.E. Baker-Ward, J.W. Cunningham, D.W. Drewes, W.P. Erchul, D.O. Gray, A.G. Halberstadt, T.M. Hess, J.W. Kalat, T.E. LeVere, J.E.R. Lunginbuhl, R.W. Nacoste, D.W. Martin, D.H. Mershon, J.J. Michael, S.E. Newman, F.J. Smith, B.W. Westbrook, M.S. Wogalter; *Adjunct Professors*: A.D. Hall, J.L. Howard, W. Tornow, L.G. Tornatsky; *Professors Emeriti*: K.L. Barkley, J.C. Johnson, H.G. Miller, P.W. Thayer; *Associate Professors*: C.C. Brookins, S.A. Lane, P.F. Horan, M.E. Haskett, K.W. Klein, S.B. Pond, A.C. Shulte, M.A. Wilson; *Adjunct Associate Professors*: B.H. Beith, B.A. Braddy-Burrus, B.F. Corder; *Associate Professors Emeriti*: J.L. Cole, R.F. Rawls; *Clinical Assistant Professors*: M.Y. Bingham, P.W. Collins; *Assistant Professors*: D.J. Bauer, S.B. Craig, C.B. Mayhorn, R. Mitchell; *Adjunct Assistant Professors*: J.W. Fleenor, C.L. Kronberg, C.E. Lorenz, S.N. Palmer, B.H. Rogers; *Associate Members of the Faculty*: C.D. Korte (Multidisciplinary Studies), R.G. Pearson (Industrial Engineering), J.L. Wasik (Statistics).

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.

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 Psychology Department.

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.

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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/psychgen.htm

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, 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).

MINOR IN PSYCHOLOGY

The Psychology Department 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.

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 spring semester of their sophomore or junior year. Further information about the HRD option is available through the Psychology Department office.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/psyhrd.htm

DEPARTMENT OF COMMUNICATION

Winston Hall, Room 201
Phone: 919/515.2450

C. A. Smith, *Head*
V. Gallagher, *Associate Head*
W. J. Jordan, *Director of Graduate Studies*
S. Stallings, *Coordinator of Advising*

Professors: R.M. Entman, W.J. Jordan, R.L. Schrag, C.A. Smith; *Professors Emeriti*: L.R. Camp, W.G. Franklin, C.A. Parker; *Associate Professors*: P.C. Caple, D.A. DeJoy, E.T. Funkhouse, V.J. Gallageher, M. Javidi, M. Johnson, R. Leonard, K. Zagachi; *Associate Professor Emeriti*: B.L. Russell; *Assistant Professors*: K. Albada, S. Jackson, J. Jameson, J. Kiwanuta-Tondos, J. Macoubrie, S. Sannels, S. Stein, J. Storr, T.L. Taylor, S. Wiley; *Assistant Professor Emeritus*: N.H. Snow; *Lecturers*: J. Alchediak, J. Heaton, D.D. Pon, C. Pullen, S. Stallings; *Instructor*: J. Pheloung; *Teaching Technician*: C. Heilig.

The Bachelor of Arts in Communication programs 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 successful completion of at least 36 semester credit hours of Communication (COM) courses. All the majors must take COM 110 and/or COM 112 (depending on their concentration), as well as COM 230, COM 240, and COM 250. COM 230, 240, and 250 must be taken in sequence during successive semesters and earn a "C-" or better in each course. COM 230 is a prerequisite to COM 240, and COM 240 a prerequisite to COM 250. Students choose one of the five departmental concentrations, in which they take the remaining credit hours in the major. The concentrations are:

Communication Disorders: The undergraduate portion or preparation for Speech-Language Therapists or Audiologist careers. A Master's degree is required for entry into these professions.
Communication Media: The curriculum focuses on the construction, distribution, use, and impact of visual images, sounds, and words conveyed through a wide range of communication media, including print, television, the Internet, and emerging technologies. Students are instructed in theories, empirical and critical study, and production of technologically mediated communication networks.
Public and Interpersonal Communication: 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: Instruction in the communication theories and methods applied by organizations to establish and maintain mutually beneficial relationships with employees, governments, stock holders, and other publics.
Theatre: Studies in stage directing, acting, scenic and lighting design, and stagecraft. African-American dramaturgy and children's touring theatre are special features of this program. Many courses are taught at Thompson Theatre on the NC State campus.

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 3.5 GPA in the minor after completion of at least nine credits of Communication courses.

Students admitted to the program must complete a total of nine credit hours, including an honors research seminar, and independent study during which the honors thesis will be written, and one 300-level or higher course in the Department of Communication or another department, covering subjects related to the thesis project. Honors students will select and work closely with an honors faculty adviser.

Students seeking to enter the program must submit a plan of study to the director of the honors program for approval. Students who complete an approved plan of study meeting the above requirements and graduate with a minimum TGPA of 3.25 and a GPA for Communication courses of at least 3.5 will have successfully met the honors program criteria. 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.
- A student must have completed 15 hours at NC State with a minimum overall GPA of 2.7 to transfer upon request from another NC State curriculum into the Communication major. Students with GPAs less than 2.7 but above 2.0 and with 60 or fewer total credit hours may apply for a waiver of this requirement for transfer admission to the major. Two waiver application periods are scheduled each year. Contact the department for an application form and deadline information. Relatively few students are granted waivers.
- No final grades below "C-" are permitted for courses used in the Communication major.
- To qualify for graduation, each student must have a minimum GPA of 2.0 for all courses completed at NC State, and at least a 2.0 GPA for all courses taken in the Communication major. The Public Relations/Organizational Communication concentration has additional requirements.

MINORS

A minor in Theater is offered.

INTERNSHIPS

The Department operates an internship program which 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.

SOCIAL WORK PROGRAM, DIVISION OF MULTIDISCIPLINARY STUDIES

1911 Building, Room 231
Phone: 919/515.2492

J. Pennell, *Director*
C. E. Waites, *Assistant Director*
L. Williams, *Director of Field Education*

Professor: J. Pennell; *Associate Professor*: C.E. Waites; *Assistant Professor*: O. Lee; *Lecturer*: L.R. Williams

The Social Work Program is fully accredited by the Council on Social Work Education and offers the Bachelor of Social Work (BSW) degree. 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, health care, substance, abuse, 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 Social Work Program 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, foreign language, philosophy, social sciences, physical education, and free electives. Thirty-three hours of core social work courses, 3 hours of social work electives, and 3 hours of statistics complete the 124 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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/cusowk.htm

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, substance abuse, public schools, developmental disabilities, and many other public and private settings.

In each of these areas there is recognition for professional preparation, and the BSW 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 Social Work Program 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 two additional courses from elective offerings, which represent the contribution of professional social work in a number of settings.

STUDENT ORGANIZATIONS

Student Social Work Association (SSWA) 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.

Student Association of Black Social Workers (SABSW) provides students with peer support, a chance to socialize with other social work majors, to process educational material, and examine how the curriculum fits the needs of African American social work majors and social work agencies in the community.

Phi Alpha Honor Society is national honor society for social work students. A 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.

Student Organization of Christian Social Workers provides students with the opportunity to glorify God through the profession of social work and to learn how, as Christians, to work in the field of social work. The organization promotes the open discussion of potential ethical dilemmas that may arise when Christian and secular viewpoints conflict.

ADMISSION TO 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 admissions 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 admissions procedure include: completion, with a grade of B- or better, of any of the following courses: SW 201, 290, 300, 307, 310; participation in an orientation session; completion of the application for admission; a personal interview with a faculty advisory committee. The program is committed to assuring that adequate resources and support services are available to meet the educational needs of students; therefore, admission decisions will be made twice a year on a space-available basis within an established faculty:student ratio. The Social Work Program Student Handbook spells out further details of this procedure, as well as other elements of the Social Work Program.

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

1911 Building, Room 301
Phone: 919/515.3180

W. B. Clifford, *Head*
P. L. McCall, *Associate Head*
D. A. Curran, *Undergraduate Administrator*
D. T. Tomaskovic-Devey, *Director of Graduate Programs*
S.C. Lilley, *Department Extension Leader*

Sociology Teaching, Research and Extension Staff: *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*: L.R. Della Fave; *Professors*: V.M. Aldige, W.B. Clifford, T.J. Hoban, J.C. Leiter, P.L. McCall, R.L. Moxley, B.J. Risman, D.T. Tomaskovic-Devey, E.M.Woodrum, M.A. Zahn, M.T. Zingraff; *Professors Emeriti*: J.N. Collins, E.M. Crawford, T.N. Hobgood Jr., L.B. Otto, M.M. Sawhney, M.E. Voland, J.N. Young; *Associate Professors*: M.P. Atkins, R.F. Czaja, 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; *Associate Professors Emeriti*: R.C. Brisson, S.K. Garber, P.P. Thompson; *Assistant Professors*: S.M. DeCoster; *Assistant Professors Emeriti*: C.G. Dawson, T.M. Hyman; *Associate Member of the Faculty*: R.D. Mustian (Agricultural and Extension Education); *Adjunct Professor*: A. Thompson (North Carolina A&T State University); *Adjunct Associate Professor*: J.R. Thigpen (East Carolina University), C.R. Zimmer (UNC-Chapel Hill).

Anthropology Teaching and Research Faculty: *Alumni Distinguished Undergraduate Professor*: A.L. Schiller; *Associate Professors*: J.M. Wallace; *Associate Professors Emeriti*: G.S. Nickerson, J.G. Peck, I. Rovner, M.L. Walek; *Assistant Professor*: R.S. Ellovich.

The Department of Sociology and Anthropology offers introductory and advanced courses in sociology and anthropology covering the major sub-fields 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 Sociology with Social Studies Teacher Education Option, Bachelor of Arts in General Anthropology, and Bachelor of Arts in Applied Anthropology.

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 300; theory, SOC 400 or 401; at least three but no more than six credit hours of 200-level sociology courses; at least 15 credit hours of 400 level or above sociology courses including SOC 400 or SOC 401. Additional electives in sociology may be at the 300 level or above. ST 311 is also required.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/basociology.html

Major in Sociology with Social Studies Teacher Education Option

This curriculum prepares the student for state certification in social studies in the secondary school system (125 hours required for graduation). The inclusion of a professional semester with practice teaching and the need for a broad base in the social sciences makes this a comparatively demanding program. Courses in education and psychology are taken beginning in the sophomore year in preparation for the teaching experience. The student learns the basic concepts of anthropology, geography, history, and political science, as well as sociology. Enrollments in Teacher Education Option programs may be limited.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/socialst.htm

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 at the following address:
Applied Anthropology
www.ncsu.edu/reg_records/ug_catalog/programs/chass/baappliedanthropology.html
General Anthropology
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bagenanthropology.html

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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/chass/bacrim.html

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.

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.

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.

COLLEGE OF MANAGEMENT

Nelson Hall
NCSU Box 8614
Raleigh, NC 27695-8614
Phone: 919/515.5565; Fax 919/515.5564
email: management@ncsu.edu
www.mgt.ncsu.edu

J.W. Bartley, *Dean*
G. J. Zuckerman, *Associate Dean for Academic Affairs*
G. A. Hankins, *Assistant Dean for Academic Affairs*
J. M. Busko, *Coordinator of Career Services*
E. O. Dixon, *Director of Admissions*
A. F. Nowel, *Director of Advising and Student Services*
J. L. Parks, *Director of Student Computing Labs*

The mission of the College of Management is to provide the citizens of North Carolina high quality education in accounting, business management and economics; to produce distinguished research and publications; and to provide high quality executive education and outreach programs. The College's undergraduate and graduate degree programs are the core of its mission and are distinguished by their excellence and their emphasis on the management of technology and those aspects of management that interface with the other technical and professional disciplines at North Carolina State University.

VISION

The College of Management will be recognized for excellence in management education, for its emphasis on the management of technology and for its unique dual-degree and cross-disciplinary programs with other colleges at North Carolina State University.

ABOUT THE COLLEGE

The College of Management offers a variety of curricula that prepare graduates to become leaders in a global business environment. Students may prepare for careers in fields such as accounting, information technology, financial management, supply chain management, marketing, sales, economic analysis, human resource management, management information systems, entrepreneurship, and general management. Opportunities for employment include corporations, consulting and public accounting firms, government agencies, and non-profit organizations. Many graduate pursue advanced studies in law, professional accounting, economics and business administration.

The curricula provide all students with a broad liberal arts background combined with a strong concentration in accounting, business, and economics. Communication skills and computer usage are stressed throughout the course work. The College faculty are dedicated to excellence in teaching and research. An outstanding faculty combined with innovative curricula provide students with the opportunity to acquire the basic knowledge and management skills necessary to become leaders in the business world. Many courses are offered in the evening as well as the day and provide part-time education opportunities to employed adults.

The three departments in the College, Accounting, Business Management, and Economics, graduate more than 500 students annually. Four undergraduate degree programs are offered: B.S. in Accounting, B.S. in Business Management, and B.A. and B.S. in Economics. The accounting and business management degrees are professionally oriented while the economics degrees are both liberal arts degrees. New freshmen and transfer students with fewer than 40 hours of college credit may enter an Undeclared Major in the College. After completing 40 credit hours, students in the undeclared major enter a degree program. Graduate degrees offered include: Master of Accounting, Master of Economics, Master of Business Administration, and Ph.D. in Economics.

The College of Management's programs in business management and accounting have earned accreditation 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 internationally and adds value to the degrees students earn from the college.

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 North Carolina State University. The program is designed for undergraduate students wishing to complement a management degree with a strong emphasis on international studies. For further information, contact Dr. John Dutton, program Co-Director at 515.6948.

ACADEMIC MINORS

Academic minors for students in other majors are offered in accounting, business management, and economics. Students should be aware that it is currently very difficult to earn a minor in business management. For more information, please see the following address: www.mgt.ncsu.edu/academic/bsbusmgt.html.

STUDENT ACTIVITIES

There are two honor societies: Beta Gamma Sigma for accounting and business management majors and Omicron Delta Epsilon for economics majors. Students also have the opportunity to join many management related organizations including the Accounting Society, Alpha Kappa Psi (professional business fraternity), Ambassador's Club, American Advertising Federation, College of Management Advisory Board, Economics Society, Entrepreneur's Club, National Association of Black Accountants, Pre-Law Student Association, Society for African-American Corporate Leaders, and the Society for Human Resource Management. These organizations sponsor social events and hold regular meetings where business leaders discuss current issues and provide career advice.

FACILITIES

Nelson Hall, the home of the College of Management, was newly renovated in 2000. A large computing lab in Nelson Hall provides students access to multimedia personal computers served by a local area network and linked to the Internet. All of the College's primary classrooms are equipped for multimedia presentations.

STUDENT SERVICES

The College of Management provides comprehensive academic advising services to undergraduate students. New freshmen and off-campus transfer students are assigned to specialized advisers. All students have access to a faculty adviser and the College's professional advising staff located in the Academic Affairs Office, Nelson Hall.

SCHOLARSHIPS

In addition to university-wide awards, the College has several scholarships for College of Management majors, primarily for entering freshmen. The College contacts all freshmen applicants for admission who may be eligible for scholarships. Upperclassmen are encouraged to contact their department, as well as the University Financial Aid office for more information on availability.

DEPARTMENT OF ACCOUNTING

Nelson Hall
Phone: 919/515.2256

F. A. Buckless, *Head*
R. L. Peace, *Director of Undergraduate Programs*

Alumni Distinguished Undergraduate Professor: R.L. Peace; *KPMG Professor:* F.A. Buckless; *Professors:* J.W. Bartley, C.J. Messere, A.Y. Chen, P.F. Williams; *Associate Professors*: M.S. Beasley, B.C. Branson, K.A. Krawczyk, D.P. Pagach, R.B. Sawyers, L.M. Wright, G.J. Zuckerman; *Assistant Professors*: B.A. Chaney, L.R. Ingram, J.G. Jenkins, K.R. Nunez; *Lecturers:* E.R. Carraway, J.W. Giles, H.O. Griffin, W.A. Koole, M. Ressner

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 currently offers a Bachelor of Science degree in Accounting. The degree requires the student to specialize in one of three concentrations: Information Systems, Financial Analysis or Managerial. In order to meet the demands of employment markets for more high skilled accounting professionals and respond to the American Institute of Certified Public Accountants' mandated 150-hour education requirement, the Department of Accounting also offers a fifth-year Masters of Accounting (MAC) degree program.

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 and computers.

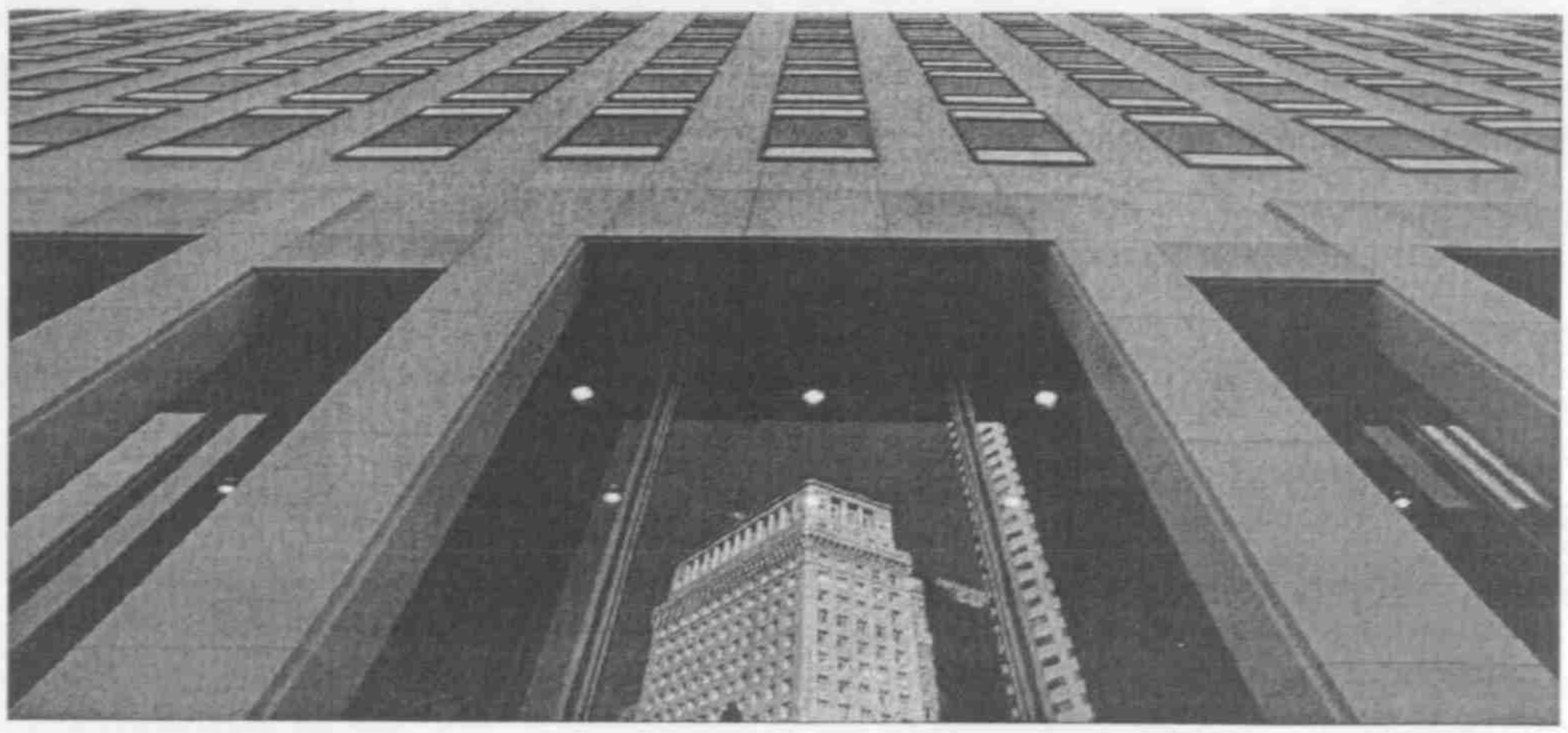
OPPORTUNITIES

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 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 SEC, IRS, and FBI, 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.



SCHOLARSHIPS AND AWARDS

Approximately 18 achievement awards sponsored by businesses and public accounting firms are made to outstanding students annually.

HONORS PROGRAM

The Accounting Honors Program is designed for academically talented and highly motivated students seeking a richer educational experience. Students can expand their understanding of accounting's role in society and to investigate accounting problems and issues in greater depth. The instructional environment gives students opportunities to develop critical thinking, problem-solving, and communication skills. Students will be better prepared for entry into graduate programs and employment possibilities.

Admission Requirements:
Completion of 30 hours of course work at NC State with at least a 3.25 overall GPA.

Graduation Requirements for Honors:
Students must achieve at least a 3.25 overall GPA and at least a 3.25 GPA in all honors courses completed.

Honors Coursework:
- 12 credit hours of honors course work minimum required. The 12 hours of honors course work must contain courses from at least two of the following categories: Special courses, advanced courses, and independent study.
- In their senior year, all honors students must take either a regularly scheduled honors section of ACC 490 or a faculty-initiated honors option in ACC 490. ACC 490 will include a major project and/or a small group tutorial that meets the Honors Program requirement for "independent study."

Remaining 9 hours credit must be selected from among the following categories:
1. Honors sections of any 300- or 400-level ACC courses
2. Student or faculty initiated honors options in any 300- or 400-level ACC course
3. Honors credit through honors section, student initiated honors option, or faculty initiated honors option in any EC or BUS course (no more than 3 credit hours from EC or BUS courses may count towards the remaining 9 credit hours.)
4. Advanced courses: 500-level MAC courses taken as elective courses or as substitutes for 300- or 400-level courses, subject to approval by the Honors Program Director.

CURRICULUM AND DEGREE REQUIREMENTS

All Accounting 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 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, 320, 330, 410, 450, and 490. A "General Policies" statement for all College of Management majors is available in 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 required 15 hours of accounting courses an includes an introduction to financial, managerial, and tax accounting.

DEPARTMENT OF BUSINESS MANAGEMENT

Nelson Hall
Phone: 919/515.5567

S. H. Barr, *Department Head*
S. G. Allen, *Director of Graduate Programs*

Alumni Distinguished Undergraduate Professors: J.P. Huggard, C.B. Kimbrough, J.W. Wilson; *Professors*: S.G. Allen, S. Barr, R.L. Clark, G.W. Dickson, R.A. Handfield, C.P. Jones, R.J. Lewis, M.A. Rappa, J.W. Wilson; *Associate Professors*: L. Aiman-Smith, D.L. Baumer, C.C. Bozarth, S.N. Chapman, S.D. Davis, J.C. Dutton, S.K. Markham, K. Mitchell, M. Montoya-Weiss, P. Mulvey, A. Padilla, J.C. Poindexter, Jr., B.B. Tyler, G. Voss, G. Young; *Assistant Professors*: R. Bergey, J. Blackhurst, J.B. Earp, D. Henard, K. Malkewitz, A. McFadyne, J.K. McCreery, F.C. Payton, S.E. Scullen, M. Walker, R. Warr, D. Zahay; *Lecturers*: J.P. Huggard, P.G. Palin, J. Powell, W. Sloan; *Associate Members of the Faculty:* A. Kingon, M.E. Kurz.

The Department of Business Management offers a Bachelor of Science degree in business management that 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 in a variety of business fields such as finance, human resources, marketing, management information systems, and operations/production management. Career opportunities are available in areas such as retailing, banking and financial services, high tech manufacturing, transportation, consulting, and government agencies.

The Bachelor of Science degree in business management consists of a broad foundation of humanities, social science, sciences, and mathematics; a comprehensive business course; and a concentration in a functional business area. The program emphasizes management in a highly competitive global economy. Students develop strong communication skills and learn to work in teams. Many courses prepare students to use information technology and computers. Required courses in the major include accounting, economics, communications, business writing, legal environment of business, computer science, finance, marketing, organizational behavior, quantitative methods, operations management, and business strategy. Business management students also complete a three-course business concentration.

CURRICULUM 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 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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/mgmt/bsbusm.htm

HONORS PROGRAM

This is open to academically talented and highly motivated students seeking a more thorough preparation for future careers in business. Students are exposed to a richer set of business problems taught in smaller classes by distinguished faculty. Opportunities are provided for students to develop critical thinking, problem solving, and communication skills. Students will be better prepared for entry into graduate programs and attractive employment possibilities.

Admission Requirements:
Completion of 30 hours of course work at NC State with at least a 3.25 overall GPA.

Graduation Requirements for Honors:
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.

Honors Coursework:

- 12 Credit hours minimum of honors work is required. The 12 hours of honors course work must contain courses from at least two of the following categories: Special courses, advanced courses, and independent study
- In their senior year, all honors students must take either a regularly scheduled honors section of BUS 480, Business policy and Strategy or a faculty initiated Honors option in BUS 480. The honors BUS 480 will include a major project and/or a small group tutorial that meets the Honors Program requirement for "independent study."

9 Credit hours of honors course work must be selected from the following categories:

1. Honors sections of 300- or 400-level BUS courses (special courses).
2. Faculty initiated honors options in 400-level BUS concentration courses (special courses).
3. Subject to approval of the Honors Program Director, 500-level MSM (daytime) courses taken as substitutes for required courses or electives (advanced courses).
4. Maximum of one honors section (3 credit hours) in any 300- or 400-level ACC or EC course (special course).

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 should be aware that it is currently very difficult to earn a minor in business management. For more information please see the following address: www.mgt.ncsu.edu/academic/bsbusmgt.html.

DEPARTMENT OF ECONOMICS

328 Nelson Hall
Phone: 919/515.3274

S. E. Margolis, *Head*
J. E. Easley, *Director of Graduate Programs*

Alumni Distinguished Undergraduate Professor: D.N. Hyman, J.S. Lapp, M.B. McElroy; *Professors*: S.G. Allen, R.L. Clark, L.A. Craig, J. Easley, E.W. Erickson, D. Fisher, D.J. Flath, T.J. Grennes, A.R. Hall, M. Holt, D.M. Holthausen, C.R. Knoeber, J.S. Lapp, S.E. Margolis, R.B. Palmquist, D.K. Pearce, J.J. Seater, W.N. Thurman, W.J. Wessels; *Adjunct Professor*: J.B. Hunt, Jr.; *Professors Emeriti*: R.M. Fearn, B.M. Olsen, C.B. Turner; *Associate Professors*: D.S. Ball, A.E. Headen, M.B. McElroy, C.M. Newmark, T.C. Tsoulouhas; *Assistant Professors*: A. Chanda; *Associate Member of the Faculty*: D.A. Hickey (Statistics).

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 or 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.

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 issues involving choice at the individual, household, firm and government level. Admission to the program requires junior standing, completion of at least 30 hours at NC State with a 3.0 GPA, and grades of B or better in EC 301, and 302. To graduate with honors in economics, a student must have at least a 3.25 overall GPA and 3.25 or better in all economics courses taken at NC State. In addition, the student must take the Honors Seminar (EC 490H) and at least two of the following honors sections of EC 301, EC 302, faculty-initiated Honors Option EC courses, or ECG courses.

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 15 hours of mathematics, statistics, and computer science. 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 in 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.

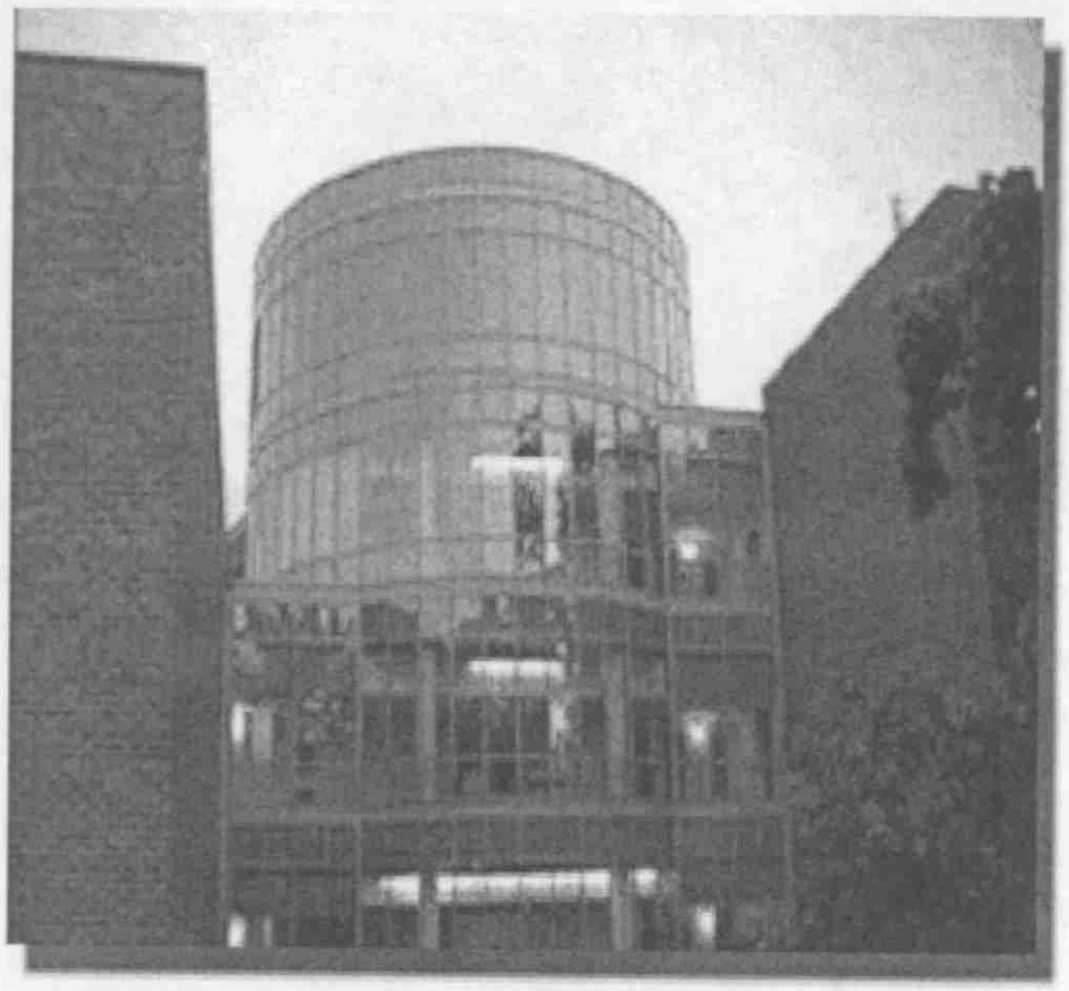
Specific curriculum requirements are available at the following address:

Curriculum in Economics, Bachelor of Arts
www.ncsu.edu/reg_records/ug_catalog/programs/mgmt/baec.htm
Curriculum in Economics, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/mgmt/bsec.htm

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 and involve them in applied work in one or more fields of economics. 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 Academic Affairs office in Nelson Hall for specific information about admission and other requirements.

COLLEGE OF NATURAL RESOURCES



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Phone: 919/515.6191; Fax: 919/513.3496
email:natural_resources@ncsu.edu
www.natural-resources.ncsu.edu

L. A. Nielsen, *Dean*
A. G. Kirkman, *Associate Dean for Academic Affairs*
J. B. Jett, *Associate Dean for Research*

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, and the Philippines.

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; 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 the same arena to students in other colleges. Eight professional curricula are administered in the College through its Departments of Forestry; Parks, Recreation and Tourism Management; and Wood and Paper Science, and two additional curricula are offered through joint administration of the Fisheries and Wildlife Sciences Program and the Environmental Technology Program with the College of Agriculture and Life Sciences. 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 sciences; forest management; natural resources assessment and management; parks, recreation and tourism management; pulp and paper science and technology; 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, 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.

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 microcomputer lab, two labs with microcomputers and workstations for applications in geographic information systems and remote sensing, 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. Facilities for field instruction and projects include 80,000 acres in the forest: the Hofmann Forest on the Coastal Plain; the Hill, Schenck, Hope Valley and Goodwin Forests in the Piedmont; and the Slocum summer camp at the Hill Forest in Durham county. Specialized 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.

FIELD 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 voluntary 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 nine-week internship immediately following the completion of the junior year. All Paper science majors spend at least one summer working in an industrial setting approved by the College. Wood Products students attend a summer practicum following the freshman year. Students in all curricula may also participate in summer jobs and the cooperative education program to gain work experience.

Local field trips are a regular part of many courses. Additional field instruction and scheduled trips to representative industries and agencies are frequently required as part of regular class assignments.

HONORS AND SCHOLARS PROGRAMS

The College of Natural Resources participates in both the University Honors Program and the University Scholars Program in which exceptional new students (freshman or transfer) are selected for special courses and activities that provide an expanded educational experience.

The purpose of the College of Natural Resources' Honors Program is to offer 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 all majors within the college) 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 are invited to 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 course PY is not required). For the B.A. degree, they follow a 30-hour major concentration in multidisciplinary studies. Included in this major are two core requirements: MDS 340 Perspectives in Agricultural History (3 credits) and MDS 498 Senior Thesis (3 credits). Participants also complete an additional MDS 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 multidisciplinary 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 the students in consultation with their advisory group, subject to the approval of the Multidisciplinary 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. 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 that are administered through the North Carolina Forestry Foundation and the Pulp and Paper Foundation. The awards include a total of over 170 scholarships for students in the forest management; natural resources, parks, recreation and tourism management, pulp and paper science and technology; and wood products and technology curricula.

COMPUTER COMPETENCY

Extensive use of microcomputers 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 advantageous in terms of convenience to purchase a personal computer. Questions about such a purchase should be directed to the Associate Dean for Academic Affairs or the appropriate departmental curriculum coordinator.

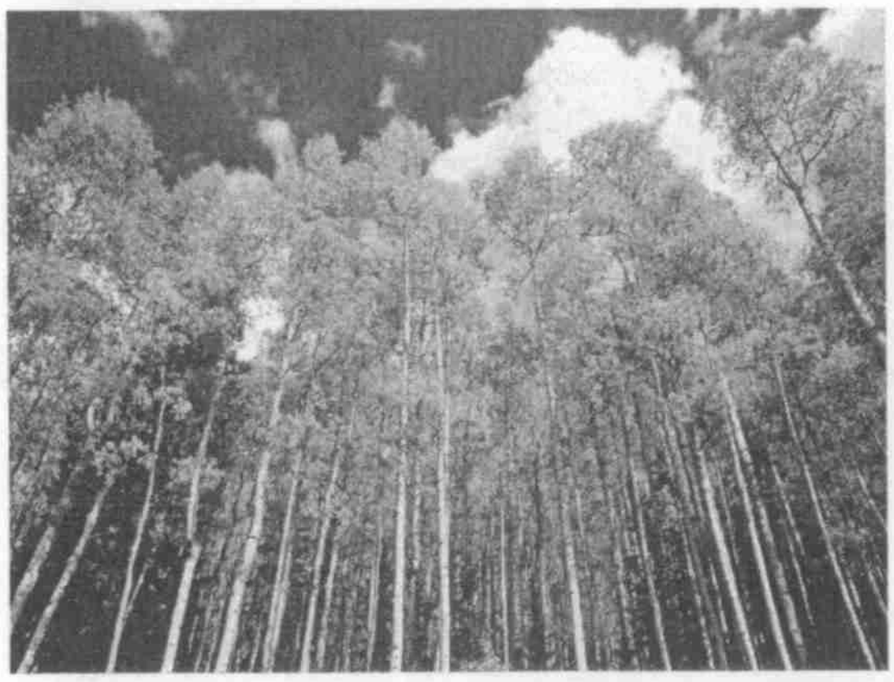
INTERNATIONAL ACTIVITIES

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 and work-abroad opportunities, some of which are led by faculty from the college, which range from two-week trips to five-week summer sessions, and to ten-week jobs in a variety of locales.

DEPARTMENT OF FORESTRY

Jordan Hall, Room 3119
Phone: 919/515.2891

F. W. Cubbage, *Head*
A. E. Hassan, *Director of Undergraduate Programs*
S. E. McKeand, *Director of Graduate Programs*



Distinguished University Professor: E.B. Cowling; *Alumni Distinguished Undergraduate Professor*: G.B. Blank, R.R. 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.I. Bruck, V.L.C. Chiang, E.B. Cowling, F.W. Cubbage, P.D. Doerr, W.S. Dvorak, E.C. Franklin, D.J. Frederick, L.F. Grand, J.D. Gregory, A.E. Hassan, J.B. Jett, S. Khorram, R.A. Lancia, S.E. McKeand, L.A. Nielsen, T.J. Mullin, J.P. Roise, R.R. Sederoff; *Research Professor*: V.P. Aneja; *Professors Emeriti*: A.W. Cooper, C.B. Davey, D.L. Holley, R.C. Kellison, R.L. Noble, T.O. Perry, L.T. Tombaugh, B.J. Zobel; *Associate Professor*: H.V. Amerson, R.E. Bardon, G.B. Blank, R.R. Braham, M.A. Buford, H.M. Cheshire, J.E. Desteiguer, L.J. Frampton, B. Goldfarb, G.R. Hess, G.R. Hodge, E.M. Jones, B. Li, L. Li, B-H. Liu, T.H. Shear, A.M. Stomp, R.W. Whetten; *Associate Professor Emeriti*: L.G. Jervis, R.J. Weir; *Associate Professor*: B.P. Bullock, J. Callazo, B.L. Conkling, D.W. Hazel, F. Isik, D.L. Kelting, S.E. Moore, C.E. Moorman, S.A.C. Nelson, E.G. Nichols, D.J. Robison, E.O. Sills, T.A. Steelman, G. Sun, L.M. VanZyl; *Research Assistant Professor*: SoEun Ahn; *Visiting Assistant Professor*: E.S. Goldgeier, S. Pattanayak, R.H. Schaberg; *Lecturers*: J.L. Cox, T.H. Litzenberger; *Associate Members of the Faculty*: P.T. Bromley, W.J. Fleming, 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), D.E. Moreland (USDA-Crop Science), E.A. Wheeler (Wood and Paper Science), S.T. Warren (Multidisciplinary Studies).

The undergraduate program of the Department of Forestry 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 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 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 Fisheries and Wildlife Sciences curriculum provides specialization needed by agencies and industries. The Natural Resources curricula provide more generalized, interdisciplinary programs in natural resources management that focus on the area indicated in the curriculum titles. The curriculum in Environmental Sciences Watershed Hydrology focuses on the specialized area of hydrologic science and watershed management.

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 the forestry (FOR) and natural resources (NR) courses of the Natural Resources curriculum and in several of the professional courses of the Environmental Sciences Watershed Hydrology curriculum. 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 five of the curricula in a similar fashion. Introductory instruction in the use of computers is provided in the freshman year, and practical assignments on the use of computers as a tool in natural resource management are integrated into the advanced courses of all three curricula. 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. Kris Fowler, College of Forest Resources Recruiting Coordinator, NCSU, Box 8001, Raleigh, NC 27695-8001, phone 919/515.5510 or Dr. Awatif E. Hassan, Director of Undergraduate Programs, Department of Forestry, NCSU, Box 8002, Raleigh NC, 27695-8002, phone 919/515.7577, email: awatif_hassan@ncsu.edu.

SCHOLARSHIPS

The Department of Forestry annually awards four types of scholarships that are available to freshmen, transfers, and advanced students: Academic, Forestry Summer Camp, Industrial and Work-Study. About 35 Academic Scholarships varying between $3000 and $4000 are awarded annually in April for the following academic year and are renewable provided that superior progress is made toward a degree. Nine endowments provide these awards: John M. and Sally Blalock Beard, Edwin F. Conger, Hofmann Forest, James L. Goodwin, and Jonathan Wainhouse Memorial, and R.B. and Irene Jordan, Class of 1960, Duke Poer, Leonard Killian-National Association of Foresters.

Five scholarships support students attending forestry summer camps. Each award provides $500-$900. Five endowments support these awards; Ralph C. Bryant, Victor W. Herlevick, Larry and Elsie Jervis, Maki-Gemmer-Johnson, and Donald Steensen.

Four Industrial scholarships are available each year. In addition to cash awards of $2000, the Industrial Scholarships provide practical work experience with industrial forestry organizations. Industrial Scholarships are supported by grants from Canal Wood Corporation, Chesapeake 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 $2400 each, carry a work requirement, which 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, Forestry Scholarship Coordinator phone 919/515.7568, fax 919/515.8149, email: richard_braham@ncsu.edu.

COOPERATIVE EDUCATION AND SUMMER WORK EXPERIENCE

Practical work experience is an important component of the professional degree programs in the Department of Forestry. Experience may be gained through participation in the Cooperative Education Program or through summer work. The department has close ties with a number of employers in the field of forestry and natural resources and provides placement assistance for the work experience programs. The Cooperative Education Program, which requires a minimum 2.25 GPA after at least one year of study for participation (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. Larry Jervis, phone 919/515.7576, fax 919/515.8149, email: jlarry_jarvis@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 science and technology, 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 accepts NC State students with a minimum 2.0 GPA and students from other accredited colleges and universities with good academic records (minimum 2.5 GPA on a 4.0 scale preferred) as transfers into the Forest Management and Natural Resources curricula. Minimum GPAs of 2.3 and 3.0 respectively are required to transfer into the Fisheries and Wild Life Sciences, Environmental Sciences Watershed Hydrology curriculum. Students at community colleges, junior 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 the equivalent courses available. 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 here 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 or courses should be directed to Dr. Awataif E. Hassan, Director of Undergraduate Programs, phone 919/515.7577, email: awatif_hassan@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. With a rigorous math and science base, the curriculum produces graduates with a broad education in the natural sciences, humanities and social sciences, communications skills, computer competency, 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 10-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 at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/forest/forman.htm

OPPORTUNITIES

Graduates in Forest Management are in demand by state and federal land-managing agencies, by industrial concerns growing wood as raw material, by state forestry and agriculture extension services, by forestry-related organizations such as nurseries and landscape management firms, and by urban natural resource management agencies. Some graduates, after acquiring professional forestry experience, are self-employed as consultants and as operators or owners of forestry-related businesses. Several recent graduates have become high school teachers, some have joined the Peace Corps, some are working in forestry-related sales and marketing and in financial management and others have joined environmental consulting firms. Many, of course, go on to graduate school to specialize in a wide variety of forestry and related programs. Employment opportunities are with the forest products industry, natural resource agencies, consulting firms, and environmental organizations.

ENVIRONMENTAL TECHNOLOGY

Environmental Technology focuses on the assessment of impacts to the environment and the technology for managing those impacts. This curriculum prepares students to collect data on *real world* environmental problems, analyze and interpret those data, and determine appropriate solutions, communications, and computer operation to acquire the technical knowledge and skills needed for sound environmental assessment and management. Many Environmental Technology courses emphasize hands-on training with state-of-the-art monitoring equipment. A parachuting to obtain actual working-world experience is required. 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.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/forest/envtech.html

FORESTRY SUMMER CAMP

An intensive, full-time, 10-week summer camp experience, with forestry 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 the summer camp after completion of the sophomore year and earn 10 semester credits for courses that provide a base of knowledge and skills for the advanced courses to come.

MINOR IN FOREST MANAGEMENT

The Forest Management minor is open to all undergraduate degree students at NC State 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 unrelated career fields who 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 be useful to students in related career fields who may be responsible for management of natural resources or interacting with foresters.

The minor in Forest Management requires a minimum of 17 credit hours that includes two required courses, FOR 212 Dendrology and FOR 460 Renewable Resource Policy and Management, and 10 credits of elective courses. Students who wish instruction and field experience in forestry technical skills may choose to attend Forestry Summer Camp. For additional information, contact Dr. Awatif E. Hassan, Director of Undergraduate Programs phone 919/515.7577.

MINOR IN WETLAND ASSESSMENT

The Undergraduate Minor in Wetland Assessment is an interdisciplinary, interdepartmental minor that is designed to provide NCSU graduates with the requisite knowledge of skills needed for entry-level competence in the field of 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 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 will begin the program in a common introductory course, NR 100, and complete the program in a common junior course, NR 300, that focuses on natural resources measurements and a senior course, NR 400, that focuses on natural resource management. Those 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 will produce 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 is added a concentration that provides advanced courses in sampling and measurement and in vegetation, soils, hydrology, and wildlife and fisheries. 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 the various levels of government and public administration provide in-depth knowledge of how public institutions work. Courses in forestry, wildlife and fisheries, and outdoor recreation provide background on issues and

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.

Specific curriculum requirements are available at the following addresses:
Natural Resources Ecosystem Assessment
www.ncsu.edu/reg_records/ug_catalog/programs/forest/ecoass.htm
Natural Resources Policy and Administration
www.ncsu.edu/reg_records/ug_catalog/programs/forest/poladm.htm

OPPORTUNITIES

Graduates with the kind of knowledge and expertise provided by the Natural Resources Ecosystem Assessment curriculum are needed in a variety of public agencies and private organizations that are involved in environmental regulation and management. Examples are the wetlands protection programs that are involved in environmental regulation and management. Examples are the wetlands protection programs of the US Environmental Protection Agency and the US Army Corps of Engineers and the various environmental regulatory programs of state and local governments. Private environmental consulting firms need entry-level professionals with broad skills in the field of environmental assessment. The broad natural resources background provided by this curriculum also provides a strong base for students who wish to go on to graduate school or environmental law or build additional specialties focused on specific job opportunities or career tracks.

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 the natural resources economics and policy arena.

CURRICULUM IN ENVIRONMENTAL SCIENCES

Hydrology is the science of water that is concerned with the origin, circulation, distribution, and properties of the waters of the earth. Watershed hydrology then 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 man's activities on that water. The curriculum in Environmental Sciences, Watershed Hydrology will produce 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 for freshmen and transfer students, contact the curriculum coordinator: Dr. James D. Gregory, Department of Forestry, NCSU, Box 8008, Raleigh, NC 27695-8008, phone 919/515.7567, fax 919/515.6193, email: jim_gregory@ncsu.edu

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/forest/wathyd.htm

OPPORTUNITIES

The increasing stresses on water resources resulting from population growth will maintain 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; therefore, graduates will be 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.

MINIMUM ENTRANCE QUALIFICATIONS

FRESHMEN:	High School GPA of 3.5 SAT total score of 1100, SATM score of 600 AI=2.7; PGE=2.5; PGM=2.8 Math: place directly into MA 141. Requires Math Achievement Test score, Level II=550 or AP Calculus Test score=2
TRANSFERS:	NCSU: Successfully completed at least 28 credit hours with a minimum GPA of 2.75 and completed CH 201/202, ENG 101, and MA 241 with minimum grades of C.
Other institutions:	Successfully completed at least 30 credit hours with a minimum GPA of 3.0 and the equivalents of CH 201/202, ENG 101, and MA 241 with minimum grades of C.

CURRICULUM IN FISHERIES AND WILDLIFE SCIENCES

(See listing under Department of Zoology)

DEPARTMENT OF PARKS, RECREATION AND TOURISM MANAGEMENT

Biltmore Hall, Room 4008
Phone: 919/515.3276
www.cfr.ncsu.edu/prtm/

P. S. Rea, *Head*

Professors: H.A. Devine, P.E. Rea, C.D. Siderelis, J.D. Wellman; *Professors Emeriti*: W.E. Smith, R.E. Sternloff, M.R. Warren; *Associate Professors*: A. Attarian, G.L. Brothers, L.D. Gustke, M.A. Kanters, R.L. Moore, C.G. Vick, B.E. Wilson; *Visiting Research Associate Professor*: P.K. Baran; *Associate Professor Emeriti*: C.C. Stott; *Assistant Professors*: L.J. Burton, Y. Leung, E.K. Lindsay; *Instructor*: K. Hamilton Brown; *Visiting Instructor*: D.E. Carter; *Adjunct Instructor*: G.R. Worls; *Lecturers*: A.C. Moore, R.W. Wade; *Visiting Lecturers*: J.I. Connors, J.B. Shields, S.K. Tebbutt.

The department offers an interdisciplinary program 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 program is nationally accredited. The department offers a curriculum in Professional Golf Management and Parks, Recreation and Tourism 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

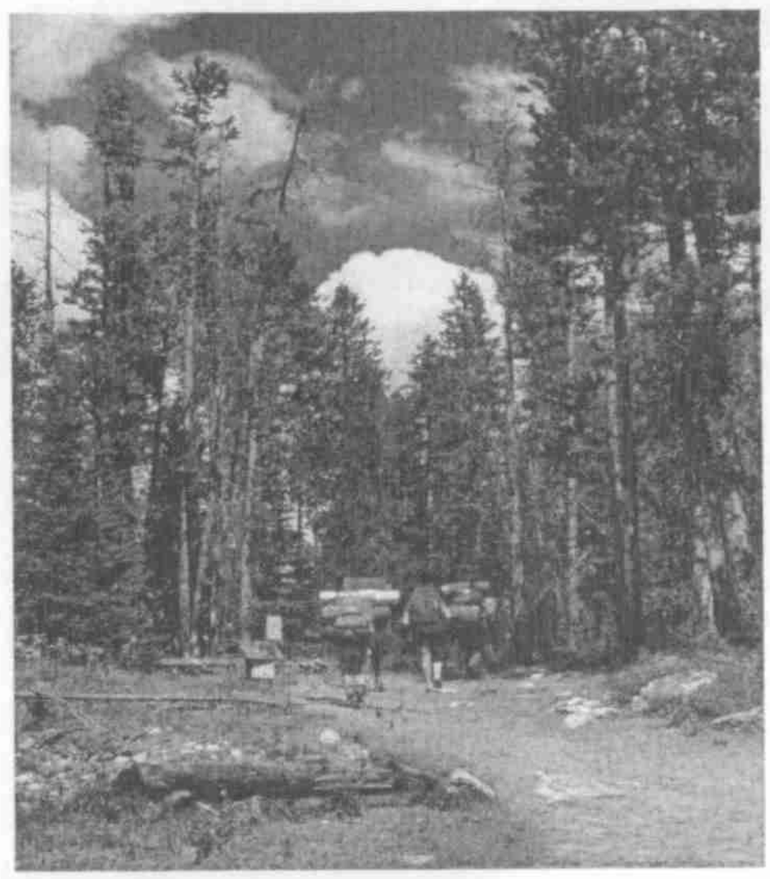
The curriculum in Parks, Recreation and Tourism Management offers a broad, general education background, basic professional and technical courses, and the opportunity to specialize in a particular field. General education courses are in natural sciences, psychology, sociology, English, mathematics, communication, 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 coursework that includes recreation philosophy, management techniques and skills, fiscal management, supervision, facility and site planning, programming, administration, and analysis and evaluation. A computer laboratory is utilized in many courses to provide the student with the best current technology available.

In addition to the general education requirements and the core professional requirements, students can begin to attain specialized training through concentration courses. In the second semester of the student's sophomore year, they choose one of the following concentrations: tourism and commercial recreation, park and natural resource management, program management, or sport 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.

CONCENTRATIONS



Park and Natural Resource Recreation
(18 hours, plus 6 hours of advised electives)

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.

Required Courses (10 hours):
PRT 442Recreation and Park Interpretive Services
PRT 462 Intro to Geographic Information Systems
BO 360 Introduction to Ecology
BO 365 Ecology Lab

Concentration Electives Courses (8 hours)

Advised Electives Courses (6 hours):
Select both Concentration Electives and Advised Electives from a recommended list.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/forest.cupark.htm

Tourism and Commercial Recreation (18 hours, plus 6 hours of advised electives)
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.

Required Courses (18 hours)*:
PRT 320 Convention & Visitor Services (3) OR
PRT 420 Resort Management & Operations (3)
ACC 280 Managerial Accounting (3)
BUS 201 Introduction to Business Processes (3)
PRT 458 Special Events Planning (3)
PRT 407 Services, Facilities and Event Marketing (3)
PRT Elective **

Advised Elective (6 hours):
Any two BUS courses at the 300 or 400 level.

*Completion of all required business concentration courses, advised electives, and one additional business course will qualify students to apply for a Minor in Business Management. Students are strongly encouraged to submit their application in accordance with guidelines outlined by the College of Management.
**Any PRT course other than PRT core courses.

Sport Management (18 hours, plus 6 hours of advised electives):
Prepares students for positions in sports environments, including recreational sport administration, athletic administration, professional sports, sport marketing and sport tourism.

Required Courses (18 hours)*:
PRT 266 Introduction to Sport Management
BUS/PRT 406 Sports Law
PRT 407 Services, Facilities and Event Marketing
PEC 479 Sport Management
ACC 280 Managerial Accounting
BUS 201 Introduction to Business Processes

Advised Electives (6 hours):
Any two BUS courses at the 300 or 400 level.

*Completion of all required business concentration courses and advised electives may qualify students to apply for a Minor in Business Management. Students are strongly encouraged to submit their application in accordance with guidelines outlined by the College of Management.

Program Management Concentration (18 hours, plus 6 advised electives):
Prepares students to develop and manage organized recreation activities for individuals and groups.

Required Courses (9 hours):

PRT 315	Org. and Admin. of Adventure Programs
PRT 266	Introduction to Sport Management
PRT 442	Interpretive Services
PRT 458	Special Events Planning

Concentration Electives Courses (9 hours)

Advised Electives Courses (6 hours):
Select both Concentration Electives and Advised Electives from a recommended list.

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, Turfgrass Management, Food Sciences, and Physical Education, is uniquely qualified to become one of the best in the nation.

The golf profession today requires expertise in a variety of areas, including turfgrass 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 business, life sciences, physical education, parks, recreation and tourism management courses, with extensive co-op experiences, will help students achieve competencies in each of the above areas.

In addition to PGM course requirements, PGM students will complete 16 months of internship/co-op at approved golf facilities under the direction of a Class A PGA professional and a PGM faculty member. PGM students are also required to complete Level II checkpoints in the Golf Professional Training Program (GPTP) prior to graduation.

Specific curriculum requirements are available at the following address:
www.ncsu.edu/reg_records/ug_catalog/programs/forest/golfmgmt.html

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 and tourism. Seven 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 to 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 919/515.7118, 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 six hours of required courses and nine hours of electives
- 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

M. J. Kocurek, *Head*
J. A. Heitmann, *Director of Undergraduate Programs*
M. Byrd, *Undergraduate Coordinator, Pulp & Paper Technology*
P. Peralta, *Undergraduate Coordinator Wood Products*

Alumni Distinguished Undergraduate Professor: M.W. Kelly; *Alumni Distinguished Graduate Professor and Elis & Signe Olsson Professor*: H. Jameel; *Reuben B. Robertson Professor*: H-M. Chang; *Buckman Distinguished Scientist*: M.A. Hubbe; *Professors*: D. Argyropoulos, H-M. Change, J. Denig, J.A. Hietmann, Jr., H. Jameel, B. Kasal, M.W. Kelly, A.G. Kirkman, M.J. Kocurek, J.S. Stewart; *Professors Emeriti*: A.C. Barefoot, E.L. Deal, E.L. Ellwood, I.S. Goldstein, J.S. Gratzl, C.A. Hart, R.G. Hitchings, L.G. Jahn, H.G. Olf, R.G. Pearson, R.J. Thomas, E.A. Wheeler; *Adjunct Professors*: L.L. Edwards, H.L. Hergert, T.W. Joyce, P.J. Kleppe, T.K. Kirk, J.J. Renard, R. Szymani; *Associate Professors*: M.A. Hubbe, J.F. Kadla, P.H. Mitchell, P.N. Peralta, I.S. Peszlen, M.K. Ramasubramanian, R. A. Venditti; *Adjunct Associate Professors*: E.K. Andrews, R.B. Phillips, H.A. Stewart; *Associate Professors Emeriti*: R.C. Allison, R.C. Gilmore, S.J. Hanover; *Assistant Professors*: U. Buehlmann, M.V. Byrd, J.J. Pawlak; *Adjunct Assistant Professor*: R.C. Peters, A.G. Raymond, Jr.; *Research Associates*: R.L. Lemanster; *Research Assistants*: W.S. Bryan; *Associate Member of the Faculty*: R.D. Gilbert.

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- Pulp and Paper Science and Technology, and Wood Products. Both curricula prepare men and women for careers in the wood and paper and allied industries or in government agencies connected with wood resources.

CURRICULA IN PULP AND PAPER SCIENCE AND TECHNOLOGY

M. Byrd, Undergraduate Coordinator

The Pulp and Paper Science and Technology curriculum prepares students for careers in pulp and paper, an industry that 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 wood pulping processes, chemical and by-product recovery systems, and pulp bleaching, as well as papermaking operations such as refining, sizing, coating, and drying.

Two concentrations are available emphasizing the technological or engineering aspects of pulping and papermaking. The Science concentration provides an extensive background in the pulp and paper manufacturing processes and elective credit hours for studies in marketing, economics, management or other concentrations of interest to the student. Greater depth in the engineering principles underlying pulp and paper manufacturing can be obtained from the Chemical Engineering Concentration. Students who have completed the Chemical Engineering Concentration in Pulp and Paper Science and Technology 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 at the following address:
Pulp and Paper Science and Technology, Science Concentration
www2.ncsu.edu/reg_records/ug_catalog/programs/forest/pupatc.htm
Pulp and Paper Science and Technology, Chemical Engineering Concentration
www2.ncsu.edu/reg_records/ug_catalog/programs/forest/pupac.htm

OPPORTUNITIES

Graduates of this curriculum find opportunities for challenging careers as process engineers, product development engineers, process control 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.

SUMMER INTERNSHIP

All pulp and paper majors are required to work one summer in a pulp or paper mill. One hour of academic credit is granted after completion of 12 weeks of millwork and presentation of a satisfactory report. In addition, students are urged to work in mills the other two summers, as the work provides valuable practical experience. Departmental adviser assist students in locating summer work.

REGIONAL PROGRAM

The pulp and paper 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 95 undergraduate academic scholarships are granted annually to new and continuing students by more than 100 companies comprising the Pulp and Paper Foundation.

MINOR IN PULP AND PAPER SCIENCE AND TECHNOLOGY

The Pulp and Paper Technology Minor is available to all undergraduate students enrolled in the University as degree candidates, except Pulp and Paper Technology Majors. The minor requires 15 credit hours. Six hours of required courses provide a comprehensive overview of pulping and papermaking science and technology, including pulling, 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 Pulp and Paper Technology 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 be 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 PPT majors are eligible for admission to the PPT minor program. The PPT 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 NCSU. 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
john_heitmann@ncsu.edu

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 acquir-

ing 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 at the following address:
www2.ncsu.edu/reg_records/ug_catalog/programs/forest/cuwood.htm

OPPORTUNITIES

The Wood Products curriculum is accredited by the Society of Wood Science and Technology. 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 frequent 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.

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

Cox Hall, Rooms 104-122
NCSU Box 8201
Raleigh, NC 27695-8201
Phone: 919/515.7833; Fax: 919/515.7855
Email: pams@ncsu.edu
www.pams.ncsu.edu

D. L. Solomon, *Dean*
J. D. Cohen, *Associate Dean for Academic Affairs*
R. E. Fornes, *Associate Dean for Research*
J. C. Herbert, *Director of Undergraduate Enrollment*
W. P. Hill, *Director of Student Services and Multicultural Affairs*
P. F. Evans, *Director of Computing and Information Services*

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, the Center for Advanced Electronic Materials Processing, the Center for the Exploration of the Dinosaurian World, 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 industrial research and development 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 "pre-professional" 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 Ms. Jennette C. Herbert, Director of Undergraduate Enrollment.

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; 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.

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, electronic 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 BS-MS programs which allow students to enroll in up to twelve credit hours of graduate level course work which may be applied toward the requirements of both the bachelor's and master's degrees.

DEPARTMENT OF BIOCHEMISTRY

(See *College of Agriculture and Life Sciences*)

DEPARTMENT OF CHEMISTRY

Dabney Hall, Room 108/Withers Hall
Phone: 919/515.2355

B. M. Novak, *Howard J. Schaeffer Distinguished Professor of Chemistry and Department Head*
C. B. Boss, *Director of Undergraduate Studies*
E. F. Bowden, *Director of Graduate Studies*
C. J. Wertz, *Executive Officer*

Chancellor: M.A. Fox; *Glaxo Distinguished University Professor*: J.S. Lindsey; *Alumni Distinguished Undergraduate Professor*: F.C. Hentz, Jr.; *Alumni Distinguished Undergraduate Professor Emeritus*: W.P. Tucker; *Professors*: A.J. Banks, E.F. Bowden, C.L. Bumgardner, D.L. Comins, B. Eaton, K.W.Hanck, J.S. Lindsey, B.M. Novak, M.H. Khaledi, G. Wahl, M-H. Whangbo, J.K. Whitsell, J.L. Whitten; *Professors Emeriti*: R.D. Bereman, H.H. Carmichael, L.D. Freedman, F.W. Getzen, F.C. Hentz, Jr., R.H. Leoppert, S.G. Levine, G.G. Long, S.T. Purrington, A.F. Schreiner, E.O. Stejskal, R.C. White; *Associate Professors*: C.B. Boss, D.L. Feldheim, S.F. Franzen, C.B. Gorman, J.D. Martin, D.A. Shultz, W.L. Switzer, B. Wang, D.W. Wertz; *Associate Professor Emeritus*: T.C. Caves, Y. Ebisuzaki; *Assistant Professors*: T.B. Gunnow, Lin He, M. Oliver-Hoyo, P. Maggard, A.I. Smirnov, T.I. Smirnova, J.L. White; *Research Professor Emeriti*: R.A. Osteryoung; *Associate Faculty*: D.W. Brenner (Materials Science and Engineering); *Lecturers*: P. Brown, F. Dennis, G. Neyhart, L. Petrovich, K.A. Sandverg, S. Sutheimer, L. Sremaniak, R. Warren; *Lecturer Emeritus*: S. Levine; *Laboratory Supervisors*: M.L. Belisle, P.D. Boyle, H.S. Gracz, G.L. Hennessee, S. King, M.M. Lyndon, S. Sankar; *Teaching and Research Technician*: D.E. Knight; *Teaching Technicians*: H.M. Simmons, M.R. Sulaiman; *Laboratory Demonstrator*: S. Cady.

HONORS PROGRAM

The Chemistry Honors Program is designed to encourage excellent students to pursue an undergraduate program that will challenge their abilities, expose them to research problems, and prepare them for graduate studies or other rewarding professional careers. To be admitted into the Chemistry Honors Program, a student in the Chemistry B.S. program must have a GPA of 3.25 or

higher. The completion of 9 extra credit hours of work that is not required for their degree(s) is needed for graduation with honors. Three to six credit hours can come from research performed in the Chemistry Department or other approved laboratories. 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, pharmacological sciences, or other molecular science courses with prior approval. Courses at the 400 level may also be considered if they are honors sections or with special approval.

Admissions Requirements:
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.

Graduation Requirements:
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 Bruce Eaton at bruce_eaton@ncsu.edu.

CURRICULA

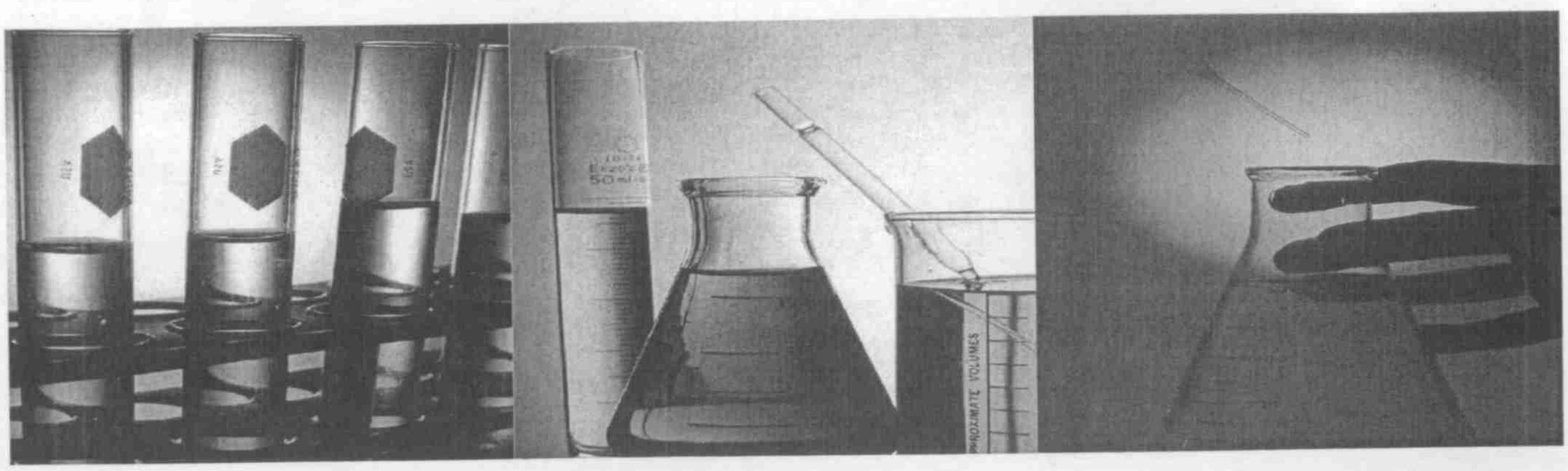
The B.A. program offers a flexible course of studies for students who may not plan to become professional chemists but who desire an interdisciplinary program with an emphasis on chemistry. The proper choice of electives will prepare the graduate for any of the following: medical, veterinary or dental 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 at the following addresses:

Curriculum in Chemistry, Bachelor of Arts
www.ncsu.edu/reg_records/ug_catalog/programs/pams/bachem.htm
Curriculum in Chemistry, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/bschem.htm
Curriculum in Chemistry, Marine Sciences Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/marchem.htm



DEPARTMENT OF MATHEMATICS

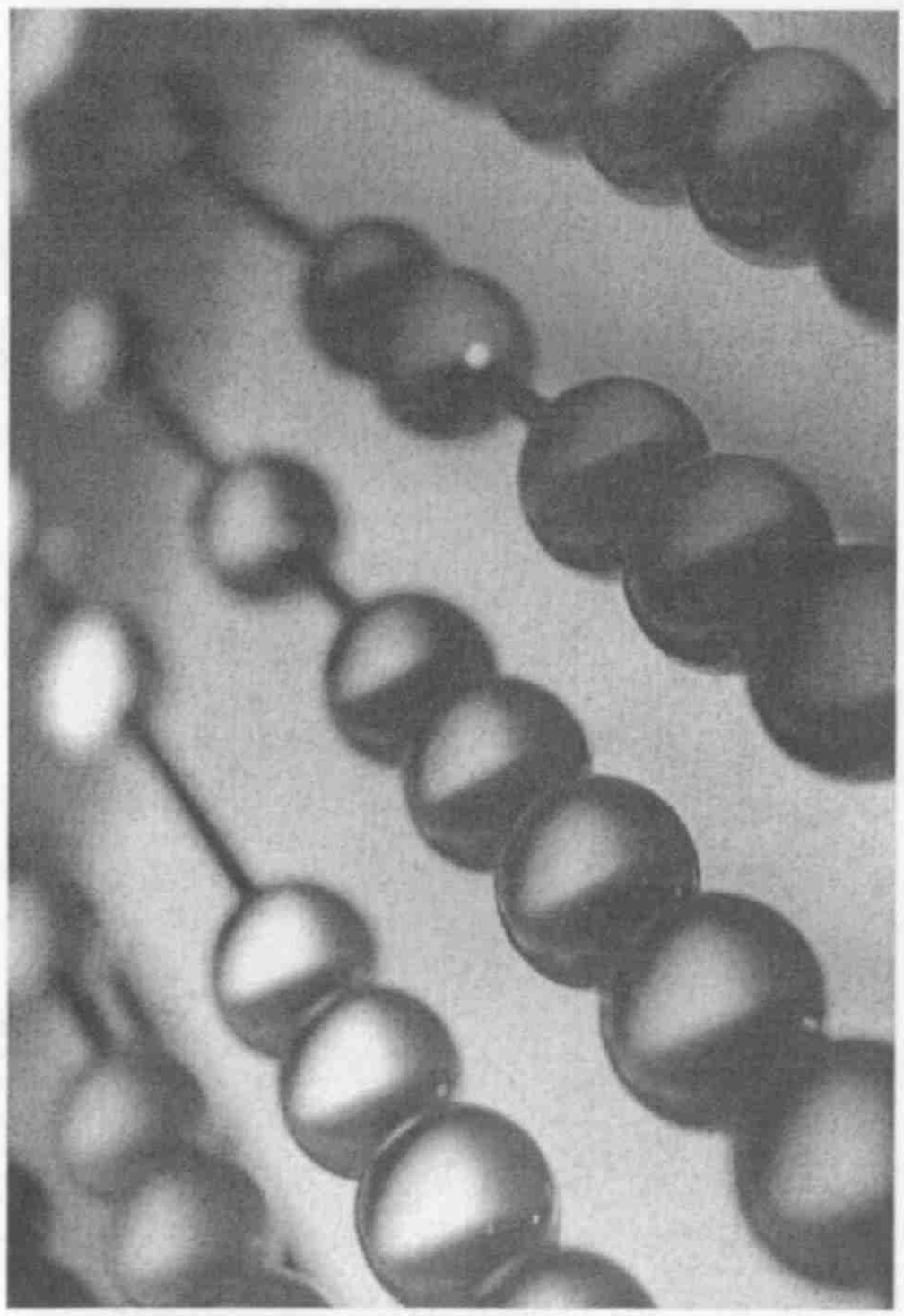
Harrelson Hall, Room 360
Phone: 919/515.2382

J. P. Fouque, *Interim Head*
J. E. Frank, *Interim Associate Head*
J. S. Scroggs, *Director of Undergraduate Programs*
J. R. Griggs, *Coordinator of Classroom Instruction*
H. J. Charlton, *Scheduling Officer and Director of Summer School*

Professors: H.T. Banks, J.W. Bishir, S.L. Campbell, M.T. Chu, E.N. Chukwu, L.O. Chung, J.D. Cohen, A. Fauntleroy, J.P. Fouque, J.E. Frank, R.O. Fulp, R.E. Hartwig, A.G. Helminck, H. Hong, I. Ispen, K. Ito, N. King, E.L. Kaltofen, C.T. Kelley, K. Koh, J.R. Kolb, X.B. Lin, R. H. Martin, N. Medhin, C.D. Meyer, K.C. Misra, C.V. Pao, E.L. Peterson, M.S. Putcha, S. Schecter, J.F. Selgrade, M. Shearer, C.E. Siewart, J.W. Silverstein, M.F. Singer, R. Smith, E.L. Stitzinger, H.T. Tran, R.E. White; *Adjunct Professor*: E.M. Peck; *Professor Emeritus*: L.B. Martin, N.J. Rose; *Associate Professors*: G.D. Faulkner, P.A. Gremaud, A. Kheyfets, T.J. Lada, Z. Li, L.K. Norris, L.B. Page, S.O. Paur, J. Rodriguez, J.S. Scroggs, F.H.M. Semazzi, S. Tsynkov, W.M. Waters; *Associate Professor Emeritus*: R.T. Ramsay; *Assistant Professors*: R. Buche, H.J. Charlton, A. Chertock, M.A. Haider, M. Kang, S. Lubkin, M.S. Olufsen, T. Pang, A. Szanto, D. Zenkov; *Assistant Professor Emeritus*: D.H. Hansen; *Lecturers*: J.R. Griggs, M.S. McCollum

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. Because of the current employment market (for both baccalaureate and graduate students), students are advised to give serious consideration to the applied mathematics program.

Career objectives can be directed toward employment in math-related jobs in business industry or government, teaching at the secondary school level, or graduate study in mathematics and/or related areas.



FACILITIES AND LABORATORIES

The math department houses a media center which provides a wide variety of support services to students and faculty. The center consists of a computer classroom with 20 Sun workstations and a Macintosh equipped room with computer equipped carrels for individual work and with a large table for tutoring and group work. Both rooms are adjacent to PAMS computer labs housing Sun and Linux workstations.

In addition Harrelson 314 and Harrelson G 108 are large PAMS computer rooms which are heavily used by the math department for computer testing and classroom computer work. These rooms are particularly heavily used by the engineering calculus classes for mathematical computing, and by online math classes for taking computer-based tests.

For students, the media center is the focal point for all computer work related to math classes at NCSU. Students go to the media center for individual work, for tutoring, and for class meetings. The proximity of the media center to PAMS computer labs means that students working in the PAMS labs have quick access to all support services provided by the media center.

The media center also houses a large collection of videotapes for introductory level math courses. These, however, are in the process of being phased out as a newer digital video library is under development.

STUDENT ACTIVITIES

The Society for Undergraduate Mathematics is a club for all students interested in mathematics, and is a Student Chapter of the Mathematical Association of America. Club activities include monthly meetings and participation in regional and national professional activities. Undergraduates in the Mathematics Department can participate in research programs with members of our faculty. In addition, many mathematics majors participate in off-campus programs, such as the NSF sponsored Research Experience for Undergraduates and the Budapest Semester in Mathematics.

Finally, undergraduate mathematics major can participate in local, regional and national mathematics contests. Many of our students perform well in these contests, and several have received national recognition.

HONORS AND AWARDS

The department recognizes its superior students with the following annual awards:

- *Math Fellowship Program*- A monetary award and work guarantees for several of the most qualified entering freshmen.
- *Hubert V. and Mary Alice Park Scholarship*- An award made to an outstanding rising junior or senior in mathematics.
- *John W. Cell Scholarship*- An award for an outstanding rising junior or senior in mathematics.
- *Carey Mumford Scholarship*- An award to an outstanding sophomore, junior, or senior in mathematics.
- *Levine-Anderson Award*- An award for that student who has the best performance in the William Lowell Putnam Examination. (This award is not restricted to mathematics majors)
- *Charles N. Anderson Scholarship*- An award for an outstanding sophomore in mathematics.
- *Charles F. Lewis Scholarship*- An award for an outstanding senior who is a double major in mathematics/mathematics education.
- *Mrs. Roberts C. Bullock Scholarship* - An award for an outstanding mathematics major who has also demonstrated an interest in the English language.
- *Dr. Rebecca R. Bullock Memorial Scholarship Endowment*- An award for an outstanding mathematics major who has also demonstrated an interest in the English language.
- *Howard A. Petrea Scholarship*- An award for an outstanding junior or senior in mathematics.

The department also has a chapter of the National Mathematical Honorary Fraternity Pi Mu Epsilon. Memberships open to those students with superior performance in mathematics courses. Professor Hien Tran is currently the faculty advisor.

CURRICULA

Specific curriculum requirements are available
at the following addresses:

Curriculum in Mathematics, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/basmath.htm
Curriculum in Applied Mathematics
www.ncsu.edu/reg_records/ug_catalog/programs/pams/appmath.htm

MINOR IN MATHEMATICS

The Department of Mathematics offers a minor in mathematics to majors in field except mathematics or mathematics education. The minor program consists of successful completion with a grade of C or better in any five three-semester-hour courses selected from among MA 225, or MA 222, but not both, and any mathematics courses numbered 300 or above (following the guidelines for credit).

DEPARTMENT OF PHYSICS

Cox Hall, Room 110
Phone: 919/515.2521

C. R. Gould, *Head*
R. A. Egler, *Assistant Head*
C. E. Johnson, *Undergraduate Coordinator of Advising*
M. A. Paesler, *Graduate Coordinator of Advising*

Named Professor: D.E. Aspnes, J. Bernholc, G. Lucovsky; *Alumni Distinguished Graduate Professor*: G.E. Mitchell, R.J. Nemanich; *Alumni Distinguished Undergraduate Professors*: R.J. Beichner, C.R. Gould, D.G. Haase, R.R. Patty, S.P. Reynolds; *Professors*: H. Ade, D.E. Aspnes, J. Bernholc, J.M. Blondin, R. Chabay, K.T. Chung, S.R. Contanch, D.C. Ellison, R.E. Fornes, C.R. Gould, D.G. Haase, C.R. Ji, C.E. Johnson, J. Krim, F. Lado Jr., G. Lucovsky, G.E. Mitchell, J.R. Mowat, R.J. Nemanich, M.A. Paesler, S.P. Reynolds, J.S. Risley, C.M. Roland, D.E. Sayers; *Professors Emeriti*: J.W. Cook, W.R. Davis, W.O. Doggett, G.L. Hall, A.W. Jenkins, K.L. Johnston, G.H. Katzin, E.R. Manning, J.D. Memory, J.Y. Park, R.R. Patty, J.F. Schetzina, L.W. Seagondollar, P.J. Stiles, D.R. Tilley; *Associate Professor Emeritus*: C.G. Cobb, D.H. Martin; *Assistant Professors*: M. Buongiorno-Nardelli, D.J. Lee, G. McLaughlin, L. Mitas, T.P. Pearl, M.C. Sagui, 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 the following research areas: astrophysics, atomic physics, physics education, nuclear and particle physics, synchrotron radiation, near-field optics, 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.

THE BACHELOR OF SCIENCE IN PHYSICS degree is broad based, and students can go on to technical careers at the bachelor's level, or go to graduate school in Physics or other fields.
www.ncsu.edu/reg_records/ug_catalog/programs/pams/cuphys.htm

THE MARINE SCIENCE CONCENTRATION, available within the B.S. in Physics program, introduces students to the dynamics of ocean circulation systems, and provides an excellent preparation for either graduate study of entry-level positions in government agencies or industry.
www.ncsu.edu/reg_records/ug_catalog/programs/pams/phymsc.htm

THE MATERIAL SCIENCE CONCENTRATION, available within the B.S. in Physics program, introduces students to Materials Science and provides an excellent preparation for either graduate study or entry-level positions in industry. The program emphasizes a fundamental broad-based knowledge of materials and materials physics.
www.ncsu.edu/reg_records/ug_catalog/programs/pams/phymat.htm

THE COMPUTATIONAL PHYSICS CONCENTRATION, available within the B.S. in Physics program, introduces students to Materials Science and provides an excellent preparation for either graduate study or entry-level positions in industry. The program emphasizes a fundamental broad-based knowledge of materials and materials physics.
www.ncsu.edu/reg_records/ug_catalog/programs/pams/compphy.htm

THE BACHELOR OF ARTS IN PHYSICS program 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. 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 at some later point after entering the university.
www.ncsu.edu/reg_records/ug_catalog/programs/pams/comphy-ba.htm

HONORS PROGRAM

The Physics Department 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 the student's 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 faculty-initiated honors option, and 500-level physics courses.

MINOR IN PHYSICS

The Physics Department 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 210, 202, 203) and two of PY 328, 341, 401, 402, 411, 412, 413, 414, 415.

DEPARTMENT OF STATISTICS

Patterson Hall, Room 220
Phone: 919/515.2528

S. G. Pantula, *Head*
W. H. Swallow, *Director of Graduate Programs for Statistics*
J. F. Selgrade, *Director of Biomathematics Graduate Program*
M. L. Gumpertz, *Director of Undergraduate Administrator*

William Neal Reynolds Professor: B.S. Weir; *Alumni Distinguished Graduate Professor*: B.B. Bhattacharyya; Alumni *Distinguished Undergraduate Professors*: E.J. Dietz, W.H. Swallow; *Professors*: R.L. Berger, 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, A.A. Tsiatis, S-B. Zeng; *Adjunct Professors*: J.R. Chromy, J.H. Goodnight, P.D. Haaland, N. Kaplan; *Professors Emeriti*: F. Giesbrecht, 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*: P. Arroway, S. Browning, M. Fuentes, M.G. Genton., S. Ghosal, S.R. Lubkin, S.V. Muse, J.A. Osborne, D. Zhang, H. Zhang; *Research Assistant Professor*: D.M. Nielsen; *Adjunct Assistant Professor*: M.A. O'Connell; *Assistant Professor Emeritus*: B.J. Stines; *Research Associate Statistician*: C.J. Basten; *Senior Statistician*: S.B. Donaghy; *Associate Members of the Statistics Faculty*: W.R. Atchley (Genetics), T.H. Emigh (Genetics), M.M. Goodman (Crop Science), A.R. Hall (Economics), M.W. Suh (Textiles); *Associate Members of the Biomathematics Faculty*: H.T. Banks (Mathematics), J.W. Bishir (Mathematics), J.F. Gilliam (Zoology), G.R. Hess (Forestry), T. Johnson (Economics), D.W. Nychka (Statistics), H.E. Schaffer (Genetics), J.F. Selgrade (Mathematics), R.E. Stinner (Entomology), H.T. Tran (Mathematics), G.G. Wilkerson (Crop Science); *Adjunct Professor of Biomathematics*: L.B. Crowder, P. Dixon, P.H. Morgan; *Adjunct Associate Professor of Biomathematics*: T.K. Pierson; *Adjust Assistant Professors of Biomathematics*: J.S. Kimbell, M.M. Lutz.

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 computer is used as a research tool by the statistician to perform the tasks of management and analysis of data collected from experiments and surveys.

The Department of Statistics is part of the Institute of Statistics, which includes Department of Biostatistics and Statistics at Chapel Hill. 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 and students in the use of statistical procedures in the physical, biological and social sciences in industrial research and development.

OPPORTUNITIES

The importance of sound statistical thinking in the design and analysis of quantitative studies is generally recognized and 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, opinion polling, crop and livestock estimation, and business trends prediction. 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 245, MA 246, 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 fields 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 for 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 by 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 perform and the junior statistician level so they can become intimately involved in the research process and in the ideal situation become a full member of the interdisciplinary research team attacking the environmental problem. Successful completion of the Environmental Sciences, Statistics Concentration will prepare students for graduate study.

Specific curriculum requirements are available at the following addresses:

Curriculum in Statistics, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/bsstats.htm
Curriculum in Environmental Sciences, Statistics Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/envstats.htm

MINOR IN STATISTICS

The Department of Statistics offers a minor in statistics to majors in any field except statistics. 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.

DEPARTMENT OF MARINE, EARTH AND ATMOSPHERIC SCIENCES

Jordan Hall, Room 1125
Phone: 919 515.3711

J. C. Fountain, *Head*
C. J. Thomas, *Sponsored Program Development Director*
D. L. Wolcott, *Undergraduate Director and Marine Sciences Undergraduate Program*
E. F. Stoddard, *Geology Undergraduate Program*
A. J. Riordan, *Meteorology Undergraduate Programs*

University Distinguished Scholars: R. Braham, T.F. Malone, Scholar in Residence; *Alumni Distinguished Undergraduate Professors*: E.C. Knowles; *Professors*: V.P. Aneja, S.P. Arya, N. Blair, S. Chang, J.M. Davis, D.J. DeMaster, R.V. Fodor, G.S. Janowitz, D.L. Kamykowski, Y.L. Lin, J.M. Morrison, L.J. Pietrafesa, S. Raman, V.K. Saxena, F.H.M. Semazzi, T.G. Wolcott; *Adjunct Professors*: W.J. Cooper, J.J. DeLuisi, A.H. Hines, S.K. Leduc, R.V. Madala, J.M. Pelissier, S.R. Riggs, M.L. Strove, John T. Wells; *Professors Emeriti*: V.V. Cavaroc, W.J. Saucier, G.F. Watson, C. Welby; *Associate Professors*: T.G. Drake, D.B. Eggleston, D. Genereux, M.M. Kimberley, C.E. Knowles, E.L. Leithold, A.J. Riordan, P.T.Shaw, W.J. Showers, E.F. Stoddard, D.L. Wolcott, L. Xie; *Research Professors*: T.F. Clark, H.G. Reichle, D.A. Russell; *Research Associate Professors*: E.M. Buckley, M. Kaplan; *Visiting Research Associate Professors*: D.S. Kasibhatla, L.A. Levin, H. Mitasova, R. Mathur, C.R. Tomas, R.W. Weiner; *Assistant Professor*: G. Lackmann; *Visiting Assistant Professors*: R.E. Barrick, C.J. Thomas; *Research Assistant Professor*: D.S. Niyogi; *Adjunct Assistant Professors*: K.V. Alapaty, J.S. Burke, D.M. Checkley, A.S. Frankel, A.F. Hanna, J.A. Hare, G.T. Kellison, G.J. Kilpatrick, A.J. Lewitus, J.E. McNinch, J.C. Reid, P.A. Roelle, S.W. Ross, R.C. Tacker; *Lecturer*: George H. Lemmons.

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 dinasaurian physiology and ecological niches; investigating global ozone depletion, or devising plans to minimize erosion and pollution of coastlines.

MEAS offers degree in meteorology, geology, marine sciences, environmental sciences and natural resources. 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. Other courses provide knowledge to explain the internal forces of the Earth, and to investigate the Earth by measuring physical phenomena like gravity, magnetism, heat, electricity and acoustic waves.

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. An earth systems history concentration produces graduates knowledgeable about the evolution of the earth 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. Marine science majors learn how the oceans, solid earth, and atmosphere interact. Students can go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. 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, and 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.

Graduates with a focus on marine sciences and oceanography 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 regulars, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society's needs for water supply and water quality, from residential and industrial supply and disposal, to ecosystem health in rivers and estuaries; they work for engineering firms and permit-issuing agencies, and they are recruited by industries that rely on geological resources. Earth systems history geologists 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 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 new 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). This is a massively parallel 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 labora-

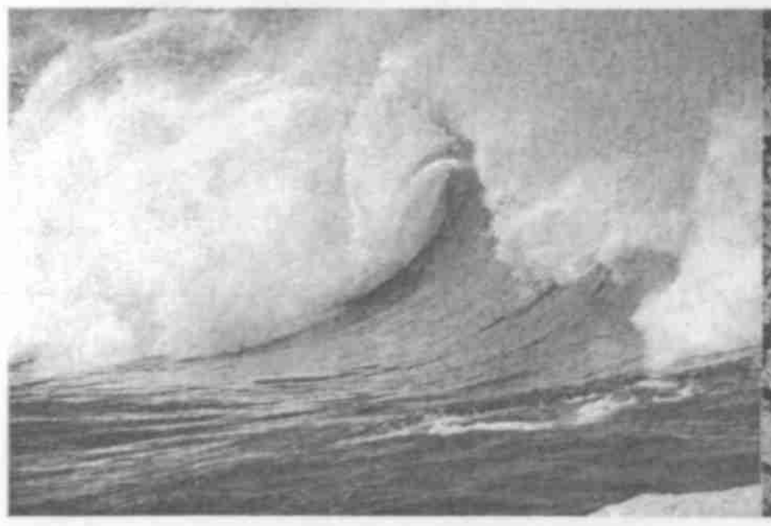
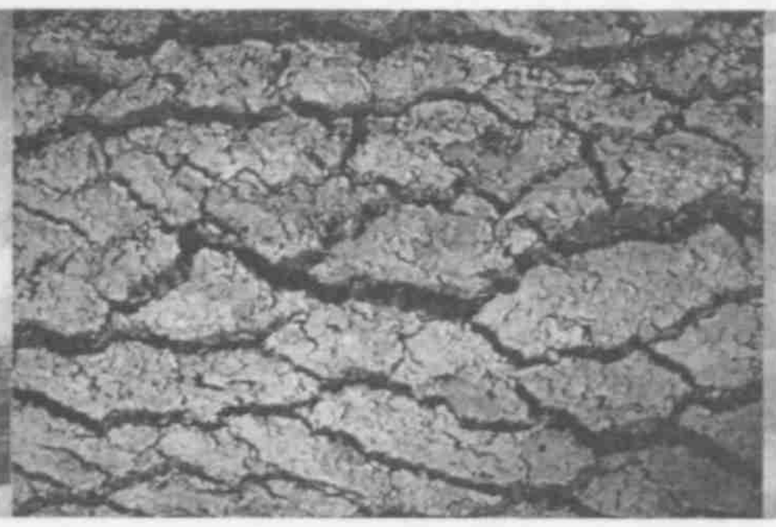
tory and field research equipment and facilities. As a member of the Duke/UNC Oceanographic Consortium, MEAS has access to the *R/V Cape Hatteras*, a 135' coastal oceanographic research vessel, which serves as a platform for work on the physics, chemistry, geology, biology and meteorology of the sea 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), and sedimentology (microcomputer-controlled grain-size analysis). Stable- and radio-isotope laboratories support research in biogeochemical cycling, paleoclimatology and paleoecology. The Center for the Exploration of the Dinosaurian World provides research opportunities for students of Earth Systems History. 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; and the FOAM-V facility. All programs benefit from access to massive computing power including the North Carolina Supercomputing Center, supported by a wide assortment of computer graphics devices and remote terminals and print services.

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 Environment Sciences -- air quality. Most students in meteorology or in forecasting are employed with private organizations and public agencies. Air quality graduate are employed by consulting firms, private industry and public agencies. The marine sciences offer four B.S. curricula with concentrations in Chemistry, Geology, Meteorology, and Physics. Earth sciences house seven curricula: B.A. (Bachelor of Arts) and B.S. in Geology, B.S. in Geology with a concentration in Marine Science, B.A. and B.S. in Geology with a concentration in Earth Systems History, 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. The marine sciences concentration adds marine sciences to the geology curriculum. Earth Systems History includes core geology courses, but with an increased emphasis on paleontology, paleobiology, and paleoecology. All 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.

Specific curriculum requirements are available at the following address:

Curriculum in Geology, Bachelor of Arts
www.ncsu.edu/reg_records/ug_catalog/programs/pams/geology.htm
Curriculum in Geology, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/bsgeol.htm
Curriculum in Geology, Earth Systems History/Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/esh.htm
Curriculum in Geology, Marine Sciences Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/geomsc.htm
Curriculum in Meteorology, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/pams/meteorol.htm
Curriculum in Meteorology, Marine Science Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/metmas.htm
Curriculum in Natural Resources, Geological Resources Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/natgeo.htm
Curriculum in Natural Resources, Marine and Coastal Resources Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/natmac.htm
Curriculum in Environmental Sciences, Environmental Geology Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/envegc.htm
Curriculum in Environmental Sciences, Air Quality Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/pams/envaqc.htm

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
Dr. Skip Stoddard
Box 8208, 919/515.7939
Department of Marine, Earth and Atmospheric Sciences
2140 Jordan Hall
skip_stoddard@ncsu.edu

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.

MARINE SCIENCES CONCENTRATIONS IN CHEMISTRY

(See B.S. Chemistry)

MARINE SCIENCES CONCENTRATION IN GEOLOGY

(See B.S. Geology)

MARINE SCIENCES CONCENTRATION IN METEOROLOGY

(See B.S. Meteorology)

COLLEGE OF TEXTILES

Room 3408, Centennial Campus
NCSU Box 8301
Raleigh, NC 27695-8301
Phone: 919/515.1532; Fax: 919/515.8578
email: tx-adnut@tx.ncsu.edu
www.tx.ncsu.edu

A. Blanton Godfrey, *Dean*
D. R. Buchanan, *Assistant to the Dean, Information Technology*
T. M. Ferguson, *Associate Dean, Academic Programs; Director of Graduate Studies*
P. R. Dail, *Director of Advising and Admissions*
Vacant, *Director of Development, Assistant to the Dean*
K. B. Hester, *Director of Student and Career Services*
T. M. Langley, *Student Services Manager, TOP Program Director*
H. F. Nerz, *Librarian, Burlington Textiles Library*
T. Brasier, *Coordinator of Diversity Programs; Director of Student Services*

The field of textiles is broad. It covers almost every aspect of our daily lives with applications in medicine, space, recreation and sports, personal safety, environmental improvement and control, transportation, household and apparel uses. These versatile materials, textiles, are made to design specifications by a variety of modern high-speed processes, utilizing tools such as lasers, electronics and computers. Textiles begins with the synthesis of fibers by man or by nature. Textiles are carried through many processes for 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 end-use products.

The approximately 5,000 alumni of the College of Textiles hold diverse positions, many in North Carolina. In the textile and related industries, occupations range from manufacturing management, marketing and sales, and corporate management to designing and styling, research and development, technical service, quality control and personnel management. These textile graduates are in the creative and management decision-making aspects of the industry. They plan the flow of materials, processes and information. They create styles, designs, patterns, colors, textures, and structures for apparel, home and industrial uses. They engineer systems and products required of industrial space, medical apparel and other uses of textiles products. They deal with computers, automation, product quality, plant performance and environmental problems. They manage large and small companies, personnel, and systems.

Opportunities remain excellent, with the college maintaining one of the university's best placement records. Demand for textile graduates from NC State University is particularly strong, due mainly to the strength of the academic programs. 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, Textile and Apparel Management, Textile Engineering, and Textile 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. A variety of 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.

Upon completion of programs in either textile technology, textile and apparel management, textile chemistry, or textile engineering, the degree of Bachelor of Science is conferred. A Bachelor of Science in Textile Engineering is offered jointly by the College of Textiles and the College of Engineering.

The College of Textiles offers the following graduate degrees: Master of Textiles, Master of Science in Textiles, Master of Science in Textile Chemistry, Doctor of Philosophy in Fiber and Polymer Science, and Doctor of 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

ELI WHITNEY DOUBLE DEGREE PROGRAM IN TEXTILE AND APPAREL MANAGEMENT AND INTERNATIONAL STUDIES

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 possible 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 Design, Art and Design Program
College of Textiles, Textile Technology Program
North Carolina State University

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/apparel 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.

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. Anni, 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.

FACILITIES

The College of Textiles on the Centennial Campus is the center for textile education and research in the US. Within its walls are a critical mass of students, faculty, facilities, and programs that will "make a difference" for United States fiber, textile, and sewn products.

MINORS

College of Textiles majors are encouraged to minor in areas outside Textiles. Of particular interest are minors in Design, Business, Foreign Language, Paper Science, and Industrial Engineering.

COOPERATIVE EDUCATION PROGRAM

This a voluntary program which combines academic study with job experience. To be eligible for the program, a student must have completed two semesters at NC State (one semester for transfer students) and have a minimum GPA of 2.25. The program provides for alternating semesters of full-time study and full-time work. A minimum of three periods is required to complete the program

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 scholars 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.

TEXTILE SCHOLARS-IN-RESIDENCE PROGRAM

This program is sponsored by the College of Textiles and the Division of Student Affairs. It is a four-year program with emphasis on a textile seminar series and educational and cultural enrichment activities. These co-curricular activities include seminars on special topics related to the textile curriculum and profession, tutorial sessions, field trips and musical and drama performances. Students are invited to join this program after their acceptance at NC State based on their predicted performance and must maintain a GPA of 3.0 to continue. All students are housed together with upperclassmen living with freshmen whenever possible.

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 students with a full differential for 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 December 1st. North Carolina Textile Foundation (NCTF) Scholarships (total value: $20,000) and Textile Foundation Presitge 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 is required. Transportation costs and other travel expenses, while held to a minimum, are paid by the student.

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. Qualified students may arrange to receive academic credit through the Industrial Intern Program.

FOUR-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 Textile 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.

ASSOCIATE OF THE TEXTILE INSTITUTE (ATI) DIPLOMA

The Textile Institute, with headquarters in Manchester, England, is a prestigious international textile organization. This organization recognizes graduates from most of the College of Textiles programs who have achieved a GPA of 2.8 or higher. These graduates will be granted full exemption from the ATI examination.

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**-AUTEX; **France**-University of Lille (ENSIT); **Finland**-Tempere University; **Germany**-University of Dresden, University of Munster; **Guatemala**-University of Valle; **Hong Kong**-Hong Kong Polytechnic University; **Japan**-Shinshu University; **Mexico**-ITESM.

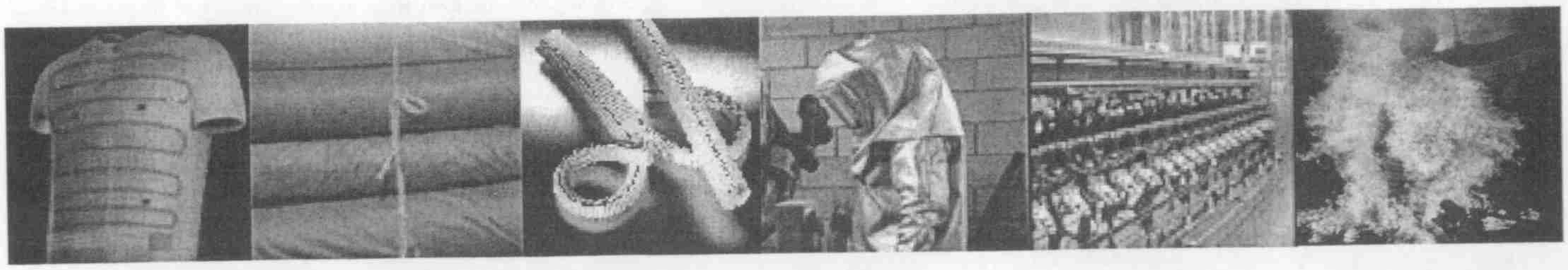
Additional information about these exchanges can be obtained from the Academic Programs Office.

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

The College of Textiles offers a distance education program for undergraduate and graduate courses via the Internet, VHS tape, and CD. Courses are available to on-campus students but must be approved by the department. For information, please visit our web site at www.tx.ncsu.edu/academic/distance or call Deborah Savage at 919/515.6627.



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 Coordinator of Undergraduate Programs*

Alumni Distinguished Undergraduate Professors: P. Banks-Lee; *Professors*: R.A. Barnhardt, S.K. Bastra, N. Cassill, R.A. Donaldson, T.K. Ghosh, A.B. Godfrey, M. King, T.J. Little, W. Oxenham, B. Pourdeyhim, A.M. Seyam, M.W. Suh; *Adjunct Professors*: R.W. Dent, W.A. Klopman, D. Sikema, T. Theyson; *Professors Emeriti*: 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, G.W. Smith; *Associate Professors Emeriti*: H. Davis, P.B. Hudson, A. Hunter, W. King, T. Lassiter, M.L. Robinson; *Adjunct Associate Professors*: W. Barrie Fraser, C. Priestland, P.E. Sasser, D. Shiftler; *Assistant Professors*: M. Jones, T. May-Plumlee, K.A. Thoney; *Assistant Professor Emeritus*: F.W. Massey; *Instructor*: G. Lawrence, L. Parillo-Chapman.

The Department of Textile and Apparel, Technology and Management offers Bachelor of Science degrees in Textile and Apparel Management and in Textile Technology. Each degree permits the student to specialize in concentrations. The curricula combine a foundation both in textile management and textile technology principles and applications. The B.S. Textile and Apparel Management degree has a Management concentration and an Apparel concentration, while the B.S. Textile Technology degree offers a Textile Design option.

CURRICULA

The B.S. in Textile and Apparel Management, together with its concentrations, provides opportunities for the student to get additional background in apparel manufacturing, production factors, law and labor relations, management science, finance and accounting.

The B.S. in Textile Technology offers the student a background in the technology of manufacturing, design, development and evaluation of textile products. The textile technology program is both flexible and diverse, requiring students to acquire an understanding of all aspects of textile manufacturing processes and products. The program involves many academic disciplines and offers a well-rounded versatile degree, which prepares students to a wide range of careers. Popular minors include Design, Foreign Language, Industrial Engineering, Business and Economics.

The Textile and Apparel, Technology and Management Department administrates the Eli Whitney Scholarship program for students wishing to undertake a study of international business in conjunction with their studies in Textile and Apparel Management. This program permits the student to earn a B.A. degree as offered by the College of Humanities and Social Science and a B.S. degree in Textile and Apparel Management. The Textile and Apparel, Technology and Management Department jointly administrates 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 Textile and Apparel Management may elect to add one of the medical textile tracks offered in the College of Textiles. Three tracks are available: Biomedical Textiles, Medical Textiles, and Healthcare Management.

The Department of Textile and Apparel Technology and Management has state of the art laboratories including the Digital Design Laboratory, Nonwovens Pilot Laboratory, Filament and Technology Lab, Sara Lee Apparel Lab, Anni Albers Design Labs, Specialty Software Computer Lab, Microscopy and Image Analysis Lab, and Management Research Lab.

Specific curriculum requirements are available at the following address:

Curriculum in Textile Technology, Bachelor of Science
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/textec99.htm
Curriculum in Textile and Apparel Management, Apparel Management Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/tamamc.htm
Curriculum in Textile and Apparel Management, Textile Management Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/tamtmc.htm

The Department publishes an online electronic journal for students and professionals in the field. The Journal of the Department 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*
H. S. Freeman, *Associate Head, Director of Graduate Programs*

Burlington Industries Professor: R.L. Barker; *Ciba-Geigy Professor*: H.S. Freeman; *Kosa Professor*: A.E. Tonelli; *Professors*: K.R. Beck, D.R. Buchanan, T.G. Clapp, B.S. Gupta, H. Hamoulda, S.M. Hudson, G.N. Mock, J.P. Rust, C.B. Smith; *Adjunct Professors*: A.P. Aneja, A. Bogdanovich, R. Goldman, D.J. Prezant; *Professors Emeriti*: J.R. Bogdan, K.S. Campbell, D.M. Cates, J.A. Cuculo, P.D. Emerson, R.D. Gilbert, P.L. Grady, D.S. Hamby, S.P. Hersh, C.D. Livengood, P.R. Lord, R. McGregor, M.H. Mohamed, H.A. Rutherford, M.H. Theil, C. Tomasino, P.A. Tucker, W.K. Walsh, W.M. Whaley; *Associate Professors*: P.J. Hauser, W.J. Jasper, M.G. McCord; *Adjunct Associate Professors*: W.P. Behnke, L.D. Claxton, R.G. Keuhni, T. Montgomery, I.D. Shin; *EM Associate Professors Emeriti*: T.H. Guion, A.C. Hayes, T.G. Rochow; *Assistant Professors*: D. Hink, J.A. Jones, R. Kotek; *Adjunct Assistant Professors*: L. Dickinson, G. Montero; *Associate Members of the Faculty*: S.K. Batra (Textile and Apparel Technology Management), P. Banks-Lee (Textile and Apparel Technology and Management), R.E. Fornes (Physics), B. Pourdeyhim (Textile and Apparel Technology and Management).

The Department of Textile Engineering, Chemistry, and Science offers Bachelor of Science degrees in Textile 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 Textile Chemistry is heavily oriented to the chemistry of polymers, their formation, and the preparation of textile materials for the consumer including scouring, bleaching, printing, dyeing and finishing. The degree program offers five different concentrations: Dyeing and Finishing Management, Dyeing and Finishing Operations, Dying and Finishing Science, Polymer Chemistry, and General Studies.

The first two concentrations are primarily for students who wish to pursue a Bachelor of Science degree, whereas the other three concentrations are oriented toward students wanting advanced studies. However, the student taking dyeing and finishing operations or dyeing and finishing management can use elective courses to achieve a background suitable for graduate studies. The General Studies concentration qualifies students for ACS (American Chemical Society) certification.

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, and waste and pollution control. 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 at the following address:

Curriculum in Textile Chemistry, Dyeing and Finishing Management Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/dyfinmgt.htm
Curriculum in Textile Chemistry, Dyeing and Finishing Operations Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/dyfinop.htm
Curriculum in Textile Chemistry, Dyeing and Finishing Science Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/dyfinsci.htm
Curriculum in Textiles Chemistry, Polymer Chemistry Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/txtpolym.htm
Curriculum in Textiles Chemistry, General Studies Concentration
www.ncsu.edu/reg_records/ug_catalog/programs/textiles/txtchem.htm

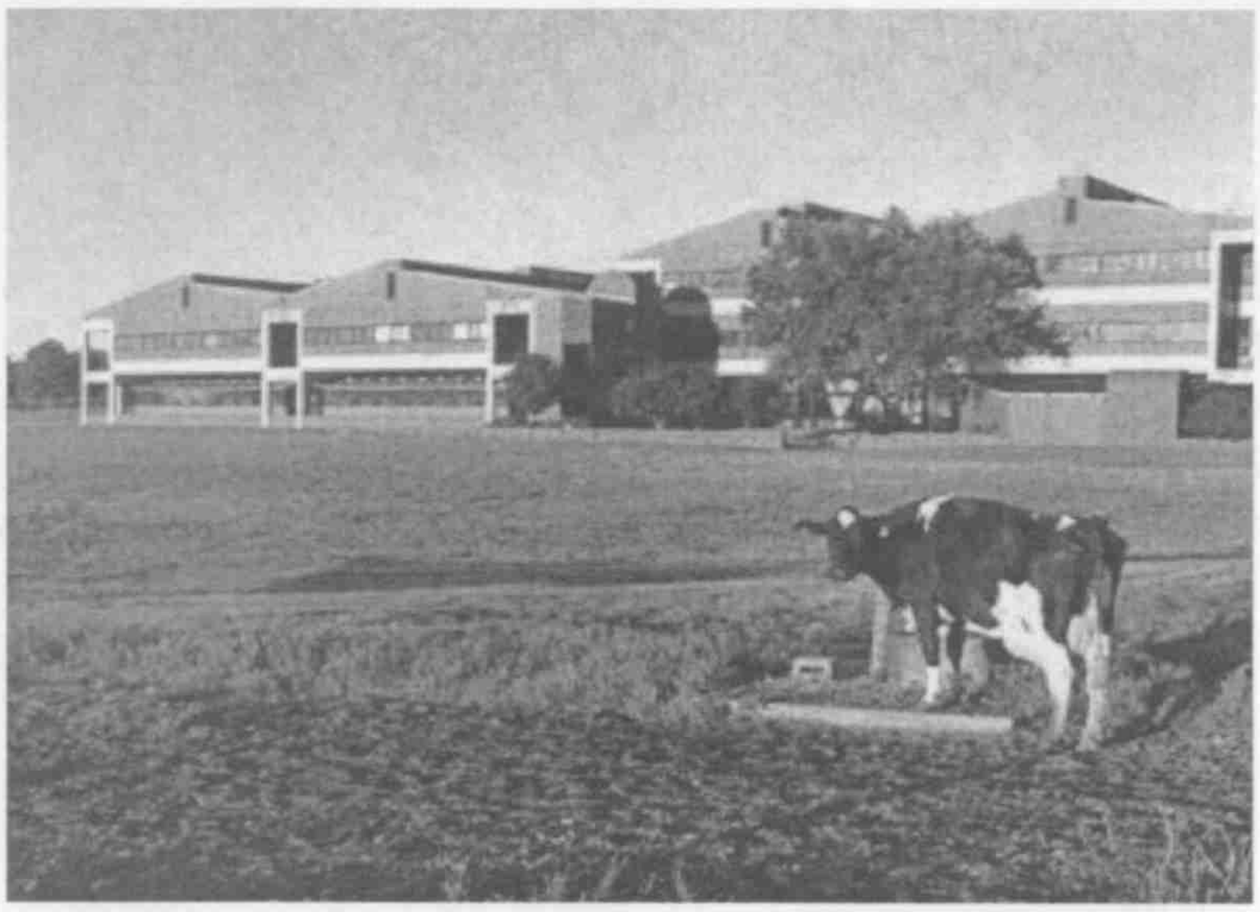
MINOR IN TEXTILE CHEMISTRY

The Textile Engineering, Chemistry, and Science Department offers a minor in textile chemistry to majors in any field except Textile 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 fabrics, and gives them an opportunity to learn how basic disciplines are applied in an industrial environment. Any interested students should contact the associate department head 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 27695-8401
Phone: 919/513.6262, Admissions; 919/513.5205, Recruitment
919/513.6212, Academic Affairs; Fax: 919/513.6197
www.cvm.ncsu.edu/index.html
email: ncsucvmdvm@ncsu.edu

O. J. Fletcher, *Dean*
D. G. Bristol, *Associate Dean and Director of Academic Affairs*
N. C. Olson, *Associate Dean and Director of Graduate Studies & Research*
Vacant, *Associate Dean and Director of Veterinary Services*
R. E. Fish, *Director of Laboratory Animal Resources*
J. Huckel, *Director of Admissions and Graduate Programs*

College of Veterinary Medicine

No specific undergraduate degree track is associated with a pre-professional 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. Pre-professional 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 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 each of the students and their pre-professional advisers to be knowledgeable of those requirements.

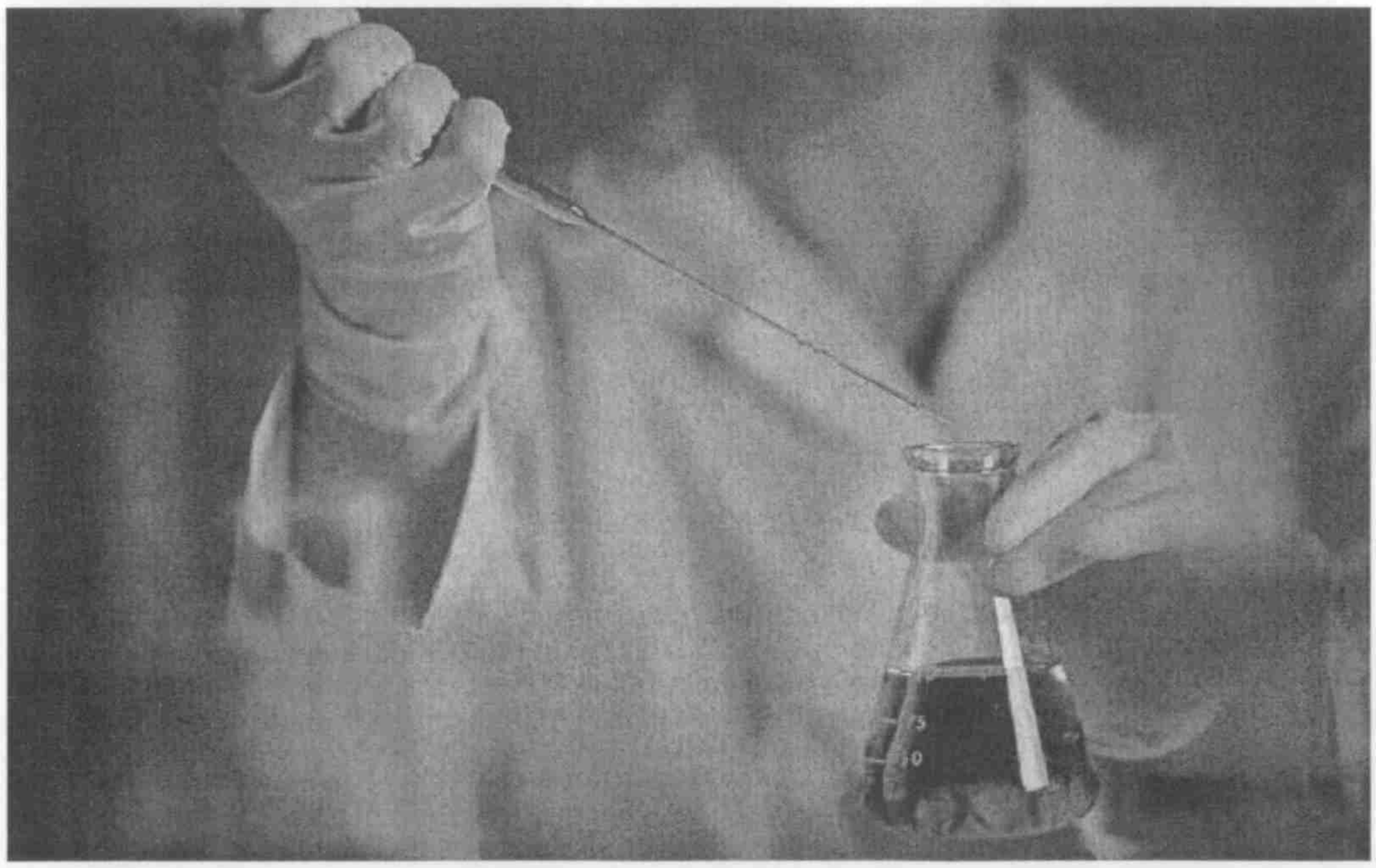
All courses listed below should be completed by the time of application to the veterinary college, except for two courses which may be pending completion in the spring semester, term, or quarter, of the year of application.

PRE-PROFESSIONAL COURSE REQUIREMENTS

BCH 451 Principles of Biochemistry	4	MA 131 Calculus for Life Management or	3
BIO 125 General Biology or	4	MA 121 Elements of Calculus	3
BIO 183 with Lab	4	MA 141 Calculus I	3
CH 101 Chemistry I and CH 102	4	MB 351 General Microbiology	3
CH 201 General Chemistry and CH 202	4	MB 352 General Microbiology Lab	1
CH 221 Organic Chemistry I with Lab	4	PY 211 College Physics I and Lab	4
CH 223 Organic Chemistry II with Lab	4	PY 212 College Physics II and Lab	4
ENG 111 Comp. and Rhetoric	3	ST 311 Intro. to Statistics	3
ENG 112 Comp. and Reading	3	Humanities/Social Science Electives	6
GN 411 Prin. of Genetics	4	Business/Finance Electives	6

PROFESSIONAL DEGREE PROGRAM 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. DVM 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, Office of Student Services, Raleigh, NC or view the college website at www.cvm.ncsu.edu.



NCSU-CVM FOR DVM ADMISSIONS

Pre-Requisite or Required Courses Beginning for the 2003 and 2004 Admissions Cycles

Required Courses	Semester Hours Required	NC State University Equivalent
Composition & Writing, Public Speaking, Communications	6	ENG 111 Composition and Rhetoric (3) and one of the following: ENG 112 Composition and Reading (3) *or* COM 110 Public Speaking (3) *or* COM 112 Interpersonal Communications *or* COM 146 Business and Professional Communications *or* COM 211 Argumentation and Advocacy (3)
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)
Statistics	3	ST 311 or ST(BUS) 250 Introduction to Statistics
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)
General Chemistry with Labs	8	CH 101 Chemistry- A Molecular Science (3) w/lab CH 202 (1) and CH 202 Chemistry-A Quantitative Science (3) w/lab CH 202 (1)
Organic Chemistry with Labs	8	CH 221 Organic Chemistry I/Lab included (4) and CH 223 Organic Chemistry II/Lab included (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)
Genetics	4	GN 411 Principles of Genetics (4)
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)
Biochemistry	3	BCH 451 Principles of Biochemistry (4)
Humanities/Social Sciences	6	Humanities courses include history, foreign language, arts, music, language. Social Science courses include psychology, sociology, and anthropology.
Business/Finance	6	Any business or finance course, including accounting and economics.

* 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.

DEPARTMENT OF MOLECULAR BIOMEDICAL SCIENCES

Gregory Cole, *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, I.W. Smoak, 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*: M. Breen, G. Dean, J.E. Gadsy, W.A. Horne, L.C. Hudson, N.E. Love, R.E. Meyer, M.G. Papick, B.P. Peters, K.A. Spaulding, C.R. Swanson; *Assistant Professors*: M.J. Burkhard, J. Barnes, L. Martin, M. Rodriguez-Puebla, D.S. Reddy, *Visiting Assistant Professor*: J.P. Douglass; *Research Professor*: M.C. McGahan; *Research Associate Professor*: J. Horowitz; *Research Assistant Professor*: J. Gookin; *Clinical Assistant Professor*: J. Neel, C. Stanton; *Instructor*: J. Khosla.

DEPARTMENT OF CLINICAL SCIENCES

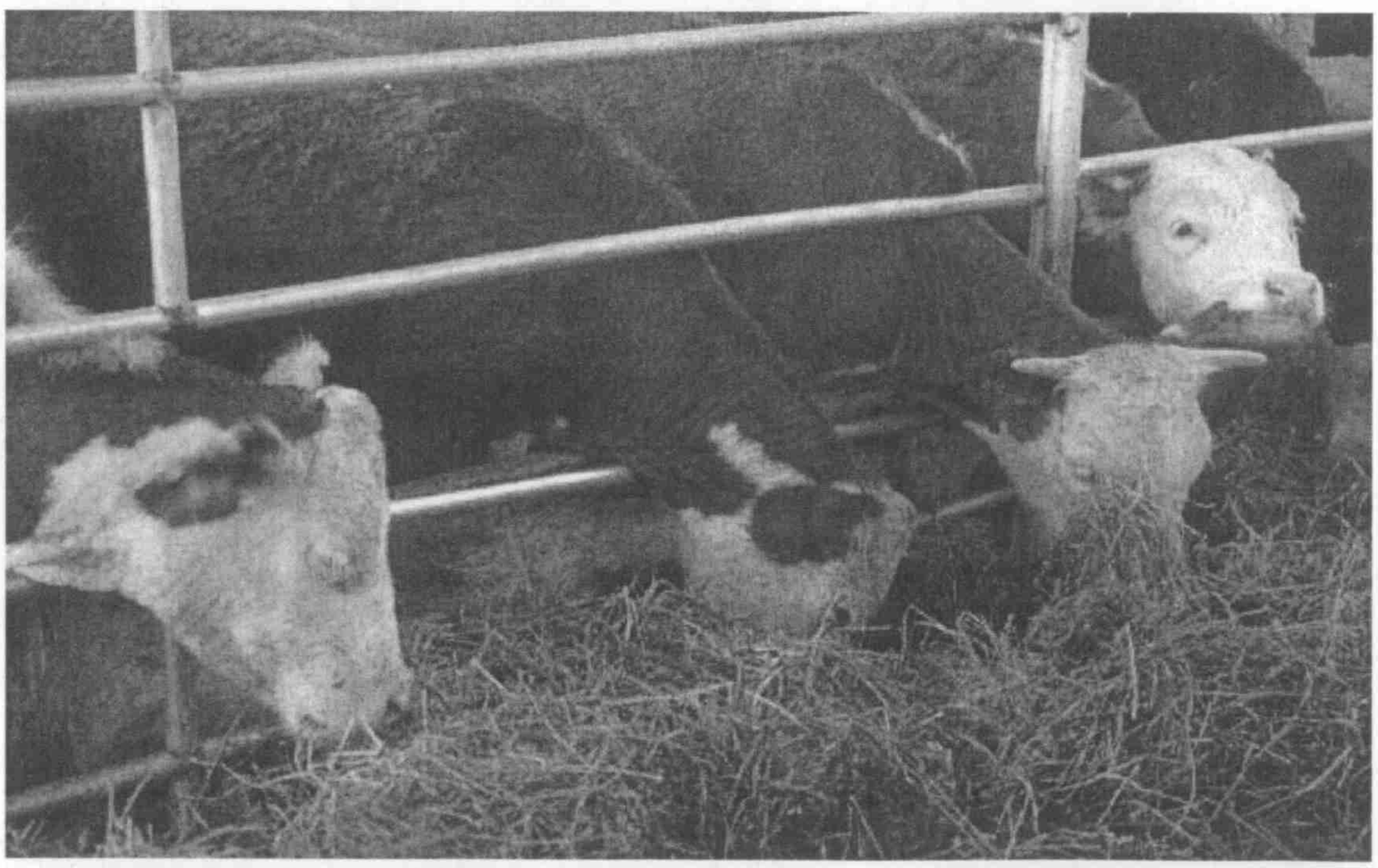
E.A. Stone, *Professor and Head*
Phone: 919/513.6230

Professor: C.E. Atkins, E.B. Breitschwerdt, S.E. Bunch, M.G. Davidson, D.J. DeYoung, K. Flammer, R.B. Ford, E.M. Hardie, E.C. Hawkins, B.W. Keene, N.A. Monteiro-Riviere, E.J. Noga, E.A. Stone, M.K. Stoskopf, L.P. Tate *Associate Professor*: K.F. Bowman, B.A. Breuhaus, D.G. Bristol, L.A. Degeneres, R.E. Fish, B.C. Gilger, G.A. Lewbart, D.J. Marcellin, K.R. Munana, T.J. Olivry, S.C. Roe, S.L. Valden; *Assistant Professor*: T.C. DeFrancesco, S. Gardner, B.D. Hansen, M.L. Hauck, H.A. Jackson, S. Jones, B.D. Lascelles, K.G. Mathews, N.J. Olby, D.M. Ruslander, L.E. Williams; *Clinical Assistant Professor*: S.A. Bissett, K.K. Ferris, M.P. Gerard, M.W. Jackson, K.M. Murphy, M.S. Rembert, S.A. Sullivan, K.H. Taylor; *Clinical Associate Professor*: W.R. Redding; *Clinical Professor*: R.A. Mansmann; *Research Assistant Professor*: A.T. Bliksigaer, C.A. Harms, P.R. Hess; *Visiting Assistant Professor and Visiting Clinical Instructor*: R.M. Linnehan, S. Pizzirani.

DEPARTMENT OF FARM ANIMAL HEALTH AND RESOURCE MANAGEMENT

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, J.P. Vaillancourt, M.D. Whitacre, *Assistant Professors*: R.E. Baynes, D. Capucille, W.A. Gebreyes, K. Linder, A.M. Miles, J. Moore, C. Pinto, J.D. Roberts, G. Smith, *Clinical Assistant Professor*: A.L. Cannedy, J. Flowers, *Research Professor*: E. Havell, *Research Assistant Professor*: R. Gehring, D. Rotstein, R*esearch Associate Professor*: S. Kennedy-Stoskopf, *Adjunct Professor*: V. Schijns, *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, M. Stebbins, *Distance Professor*: J.E. Riviere, *Poultry Extension Specialist*: D. Carver, *Swine Extension Specialist*: M. Morrow, *Director, Electron Microscopy*: Michael Dykstra.



OTHER ACADEMIC AND ADMINISTRATIVE UNITS

DIVISION OF UNDERGRADUATE AFFAIRS

140 Leazer Hall
NC State Box 7105
Raleigh, NC 27695-7105

www.ncsu.edu/undergrad_affairs
phone: 919/515.3037
fax: 919/515.4416

James Anderson, *Vice Provost*
Jo Allen, *Associate Vice Provost*
John Ambrose, *Assistant Vice Provost*
Roger Callahan, *Senior Director*

Undergraduate Affairs Staff: J. Allen, J. Ambrose, J. Anderson, F. Artis, A. Atkin, K. Baker, A. Bell, L. Blanton, J. Bong, M. Bowden, M. Bresciani, B. Bukhay, D. Burton, R. Callahan, P. Cellini, C. Chafin, E. Clegg, C. Christopher, J. Dockery, B. Edwards, S. Foley, D. Freeman-Patton, M. Gainey, L. Gonzalez, J. Gottlieb, K. Hauschild, J. Hawkins-Morton, A. Irby, L. Jacovec, S. Jones, G. Johnson, C. Leger, S. Matney, R. McGraw, C. McLean, R. Mimms, P. Murphy, P. Moses, J. Moylan, C. Newkirk-White, J. Odom, K. Outing, K. Powell, E. Reid, J. Robinson, V. Ruffin-Jenkins, C. Stonehouse, C. Sutton, M. Taliaferro, M. Tetro, K. Vandreumel, Y. Walker, K. Wallace, C. Sabourin Ward, G. Wical, M. Wicker, L. Wilson, B. Windom, D. Wood, C. Zelna

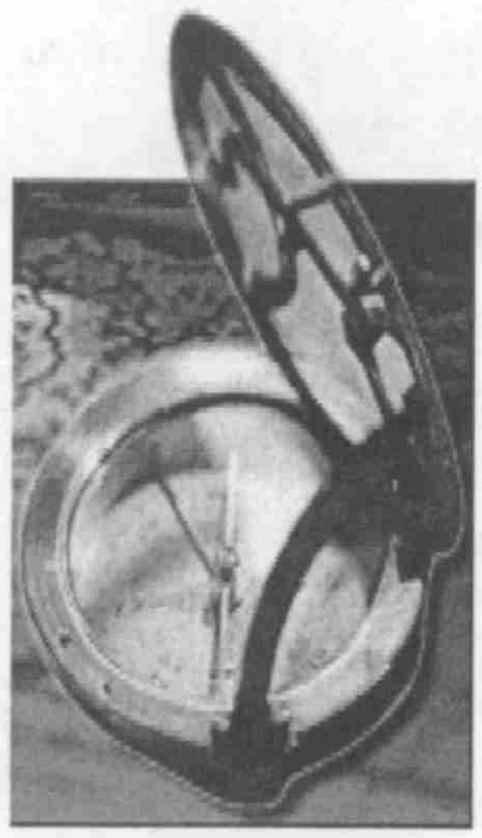
NC State University's Division of Undergraduate Affairs (UGA) promotes excellence and effectiveness in undergraduate education. UGA is charged with the development of a coherent vision for undergraduate education, the coordination of academic policy and curricular programming, and the strengthening of all academic support programs. UGA 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.

THE FIRST YEAR COLLEGE

43 Tucker Hall
NC State Box 7925
Raleigh, NC 27695-7925

www.ncsu.edu/fyc/
phone: 919/515.8130
fax: 919/515.8267

John Ambrose, *Director*
Janice Odom, *Associate Director*
Andrea Atkin, *Assistant Director for Curriculum and Teaching*
Jacqui Hawkins-Morton, *Assistant Director for Advising and Training*
Mary Tetro, *Assistant Director for Advising and Administration and Coordinator of Advising*



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 freshman year, specially programmed residence halls, and the Faculty Fellows Program, through which faculty from across the University volunteer to work in various capacities with First Year College students and advisers.

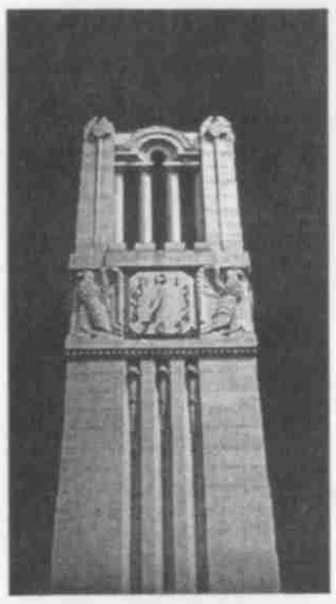
ACADEMIC SUPPORT PROGRAM FOR STUDENT ATHLETES

Reynolds Coliseum
NC State Box 7104
Raleigh, NC 27695-7104

www.ncsu.edu/undergrad_affairs/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 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.



NEW STUDENT ORIENTATION

123 Leazer Hall
NC State Box 7525
Raleigh, NC 27695-7525

www.ncsu.edu/undergrad_affairs/nso
phone: 919/515.1234
fax: 919/515.5844

Roxanna McGraw, *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. The Office of New Student Orientation is also committed to providing leadership to enhance programs that respond to student transition needs.

HONORS PROGRAM

Clark Hall
NC State Box 8610
Raleigh, NC 27695-8610

www.ncsu.edu/university_honors/
phone: 919/513.4078
fax: 919/513.4392

Larry Blanton, *Director*

The Honors Program prepares excellent students for admission to and success within graduate and professional schools in the United States and abroad and positions students for national scholarships and fellowships. The program centers on NC State's mission and institutional strengths in discovery-, inquiry-, and creativity-based scholarship, i.e., research. The Honors Program will offer a series of HON Seminars and workshops, including a significant capstone research or creative experience that includes faculty guidance and focuses on the creation or expansion of new knowledge, particularly as a foundation for experiences that are conducive to post-baccalaureate education.

TRANSITION PROGRAM

141 Leazer Hall
NC State Box 7105
Raleigh, NC 27695-7105

www.ncsu.edu/undergrad_affairs/transprg.html
phone: 919/515.7053
fax: 919/515.4416

Ronald Mimms, *Director*

The Transition Program is a small, highly selective program for students who are academically eligible for admission to NC State but not into their first or second choices of colleges. The one-year program is designed to help students who demonstrate academic or transitional needs make appropriate decisions and accommodations for their academic success at NC State.

UNDERGRADUATE ASSESSMENT

126 Leazer Hall
NC State Box 7105
Raleigh, NC 27695-7105

www.ncsu.edu/undergrad_affairs/assessment/assess.htm
phone: 919/515.6433
fax: 919/515.4416

Marilee Bresciani, *Director*

The Office of Undergraduate Assessment helps undergraduate academic programs, academic support programs, and learning initiatives plan, develop, implement, and use their assessment activities in accordance with the mission, goals, and planning process of the Division and the University. The office provides key education and resource support for faculty, staff, and administrators who want to learn more about creating meaningful and ongoing assessment in an effort to promote continuous improvement at NC State.

TUTORIAL CENTER

147 Leazer Hall
NC State Box 7105
Raleigh, NC 27695-7105

www.ncsu.edu/tutorial_center/index.html
phone: 919/515.3163
fax: 919/515.4416

The Undergraduate Tutorial Center provides 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 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.

VIRTUAL ADVISING CENTER

Lee Residence Hall
NC State Box 7105
Raleigh, NC 27695-7105

www.ncsu.edu/advising_central
phone: 919/515.5594
fax: 919/515.4416

Andrea Irby, *Director*

Advising Central is NC State's virtual advising center, designed to provide email and Internet-based advising to prospective and current undergraduate students. The goals of Advising Central are to make academic policies clear and meaningful for students, to help them navigate through NC State's human resources to find advice from the most knowledgeable person in a particular field, and to help students clarify their academic direction and strengthen their academic skills.

COOPERATIVE EDUCATION PROGRAM

212 Peele Hall
A. S. Bell, *Director*

This optional program is structured so that the student 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 in the College of Engineering 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 an engineering degree program prior to beginning the first co-op assignment. Further information may be obtained from the Office of Cooperative Education, 212 Peele Hall.

THE NC STATE UNIVERSITY WOMEN'S CENTER

Frances D. Graham, *Director*

The NC State Women's Center, located in 3120 Talley Student Center, serves as a resource and referral center for campus and community programs and services for and about women and gender equity issues. The Women's Center is a unit of Student Affairs. The mission of the Center is to promote, support, and empower women on campus, to advocate for a university environment which eliminates barriers, diminishes prejudice and bigotry and extends a supportive climate to all women; increase awareness and understanding of multicultural women's concerns and gender equity issues, including an emphasis on how these issues affect both women and men; provide visibility for women, women's concerns, and women's contributions.

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 with particular concern for issues of sexual violence, race ethnicity, class, national origin, physical challenge, disability and sexual orientation. Specific programs, services, or student groups, such as the Wolfpack N.O.W., are designed to provide students with peer support, leadership experiences, and positive role modeling. Such experiences 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.

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. The Women's Center offers an array of programs for students, faculty and staff throughout the school year.

The office also provides confidential assistance, information and referrals for sexual harassment, sexual assault, and domestic/relationship violence. The Director of the Women's Center serves as a Sexual Harassment Resolution Officer and as an Advocate trained to respond to rape survivors.

The Molly Hays Glander Rape and Sexual Assault Response Line is available 24 hours a day, seven days a week. Advocates are trained volunteers who provide caring, confidential support as well as resources, referrals, and information for survivors of rape and sexual assault. Anyone who is dealing with a rape or sexual assault may call an Advocate for help and assistance. To reach an Advocate, call the Rape and Sexual Assault Response Line at 218.9102.

For more information contact Frances D. Graham, Ph.D., Director of the Women's Center, 3120 Talley Student Center at 515.2012 or email: frances_graham@ncsu.edu.

THE GRADUATE SCHOOL

R. S. Sowell, *Dean*
R. C. Rufty, *Associate Dean*
D. K. Larick, *Associate Dean*
D. M. Shafer, *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, 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.*

MILITARY EDUCATION AND TRAINING

DEPARTMENT OF MILITARY SCIENCE (ARMY ROTC)

Commander Michael Wawrzyniak, *Professor*

Instructors: Major Judith Cannon, Major Tracy Davidson, Captain Sean Truax, Master Sergeant Marc Tuttle

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 six-semester-hour Basic Course (freshmen and sophomore level) and a two-year Advanced Course (junior and senior level) that includes a six-week camp 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 received the ROTC Advanced Course subsistence payment of $350 per month for Juniors and $450 for Seniors, plus approximately $150 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.

Basic Summer Camp: Successful completion of the five-week basic summer camp, held at Ft. Knox, Kentucky, is an alternative to the Basic Camp.

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 34th 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 my 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 $350 per month for Juniors and $450 per month (tax free) up to a maximum of $4000. 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 their 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 Military Science Department's faculty. The intensive summer Advanced Camp is extremely effective in developing one 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 AEROSPACE STUDIES (AIR FORCE ROTC)

Colonel Joseph H. Fitzpatrick, *Professor*

Instructors: Major Cindy L. Casey, Major Michael S. Chapman, Major (Select) Rodney L. Fauth

AFROTC Program: There is a four-year and a two-year program that leads to a commission in the United States Air Force (USAF). 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. These first two years are called the General Military Course (GMC). The last two years of AFROTC comprise the Professional Officer Course (POC). Non-AFROTC sophomore students may compete with GMC cadets for a position in the POC and obtain a commission under the two-year program.

The two-year 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 six-week summer field training encampment.

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, soaring, 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. This applies even to students who are not pursuing a military commission. Contact the Aerospace Studies department for more details.

Financial Aid: Air Force ROTC students are encouraged to apply for scholarships for two or three years. 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. POC cadets not receiving any other Air Force scholarship may receive a $1,725/semester scholarship called POC Incentive, or POCI. All scholarships have minimum academic standards that must be maintained. Students in the GMC, other than scholarship students, receive no monetary allowance. Additionally, special scholarships are awarded to fill critically needed academic majors within the Air Force. Currently, the Electrical Engineering and Meteorology 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 leadership laboratory, traditional military social functions, base orientation trips, and cadet-centered programs.

Eligibility: All full-time freshman and sophomores may enroll in the GMC without obligation to the Air Force. 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 drill and color guard teams, support the wing organization as well as the university.

Uniforms: Uniforms are provided by the federal government and are only worn on the day of Leadership Laboratory or as specified by the cadet corp leadership.

Internet Access. To view the NCSU Air Force ROTC website, point your browser to the following address:
www.ncsu.edu/airforce_rotc/intro.html

NAVAL SCIENCE (NAVAL ROTC)

Captain Dennis Haines, *Professor of Naval Science*

Associate Professors: Lt. Col. Kenneth Thompson, Capt. Edward Sager; *Instructors:* LT. William Coleman, LT. Richard Green, LT. Jason Geddes, LT. Thomas Keenan

Mission: The purpose of the Naval Reserve Officers Training Cops is to develop midshipmen mentally, morally, and physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to commission college graduates as naval officers who possess a basic professional background, are motivated toward careers in the naval service, 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, supply uniforms, and pay $150 per month tax-free subsistence allowance and provide a $250 book allowance each semester 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 $150 per month subsistence allowance during the final two years of the program. 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 Marine Officer candidates. For others who may decide up on a Marine Corps commission after joining NROTC program as third year, selection for the Marine Option may be made in the sophomore year. A midshipman's status as a Marine Option will result in some modifications to the curriculum and the final summer training period.

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 Naval Orientation, Engineering, Weapons Systems, Navigation, Naval Operations, and Leadership and Management. Marine Option midshipmen substitutes 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 one leadership laboratory period each week.

Midshipmen Life: Academic excellence is emphasized through the NROTC Program with commensurate participation in the full range of campus extra curricular activities. 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.

DEPARTMENT OF MUSIC

Price Music Center, Room 203
Telephone: 919/515.2981
Fax: 919/515.4204

Campus Box 7311
Raleigh, NC 27695-7311
E-mail: robert_petters@ncsu.edu

R. B. Petters, *Director of Music*
J. C. Kramer, *Associate Director of Music*

Assistant Directors: J. A. Entzi, R. M. Foy, J. A. Fuller, M. S. Lynch, R. A. Meder, P. H. Vogel, E. B. Ward

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 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 performance, piano, instrumental, vocal, history/literature, and theory/composition.

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.

DEPARTMENT OF PHYSICAL EDUCATION

Carmichael Gymnasium, Room 2000
March L. Krotee, *Professor & Head*

Associate Professors: S.V. Almekinders, A.L. Berle, J.V. Brothers, H.L. Brown, J.L. DeWitt, T.W. Evans, R.G. Gwyn, S.C. Halstead, V.M. Leath, I.F. Ormond, C.E. Patch, G.W. Pollard, T.C. Roberts, J.L. Shannon, R.R. Smith; *Lecturers:* J.R. Carroll, J.A. Kagendo-Charles, W.A. Cheek, T.S. Dash, P.S. Domingue, G.T. Holden, J. Horne, T.D. Jones, R.H. Kidd, M.R. Lester, K.K. Lewis, C.S. Ousley, M.S. Rever, L.E. Scott, E.V. Smith, G.E. Wall, T.C. Winslow, G.R. Youtt; *Part-Time Lecturers:* O. Ashe, R.N. Bechtolt, M. Cranfill, K. Douglass, E.M. Fink, R. Harris, L. Kerigan, K. Long, D.D. Smith, M.A. Stevenson, E.C. Stoddard, S.M. Yates

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 course.

Students may participate in an activity they are familiar with or learn a totally new activity. Students with disabling conditions will be assisted by Physical Education, Student Health Service, and University 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. It is designed to prepare students to assume fitness leadership responsibilities in both the public and private sector. The minor provides students with the fundamentals of anatomy, physiology, biomechanics, and nutrition. The development and assessment of fitness programs and protocols using various exercise modes and equipment/technology and the ability to apply these skills through a practicum is also part of the minor. For additional information, contact Nita Horne at 919/515.6382.

MINOR IN OUTDOOR LEADERSHIP

The Department of Physical Education offers a 17-hour minor in Outdoor Leadership, which 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 obtaining this minor will develop a foundation of essential leadership skills and experience through course work focusing on outdoor skills and leadership training as well as an opportunity to apply theory to practice through a practicum. For additional information, contact Terry Dash at
919/515.1392.

MINOR IN COACHING EDUCATION

The Department of Physical Education offers a 19-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, anatomy, physiology, and kinesiology, as well as strategies involved in coaching specific sports, are also addressed. For additional information, contact Dr. Charles Patch, 919/513.1547.

OFFICE OF RESEARCH AND GRADUATE STUDIES

John Gilligan, *Vice Chancellor*
Steve Lommel, *Assistant Vice Chancellor for Research and Development*
Matthew K. Ronning, *Associate Vice Chancellor for Sponsored Programs*
Vacant, *Assistant Vice Chancellor for Technology Transfer*

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 for Research and to the Provost.

The Vice Chancellor acts as the principal liaison representative between granting agencies 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; manages the technology transfer activities of the university, administers the allocation of faculty research development funds; 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.

INSTITUTE FOR EMERGING ISSUES

N. Pickus, *Director*
Phone: 919/515.7741

The Institute for Emerging Issues charts new directions in science, technology, and public policy. It brings together North Carolina, southern, and national leaders to generate innovative policies and spur multisectoral collaborations. The Institute's annual Emerging Issues Forum is a public service program designed to bring the highest levels of public policy debate to the people of North Carolina.

NORTH CAROLINA JAPAN CENTER

F. A. Moyer, *Director*

The North Carolina Japan Center, part of the College of Humanities and Social Science, 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 the monthly "First Thursday Club" which presents a diverse range of programs on 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.

BIOTECHNOLOGY PROGRAM

Robert M. Kelly, *Director*

The Biotechnology Program at NC State includes some 170 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. Research in biotechnology is multidisciplinary encompassing three main areas: molecular biology, bio-processing/bio-analytical techniques, and in-vitro cell culture. One of the unique aspects of our graduate and undergraduate Biotechnology Minors is the focus on laboratory techniques. 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, please visit http://www.ncsu.edu/biotechnology.

MATERIALS RESEARCH CENTER

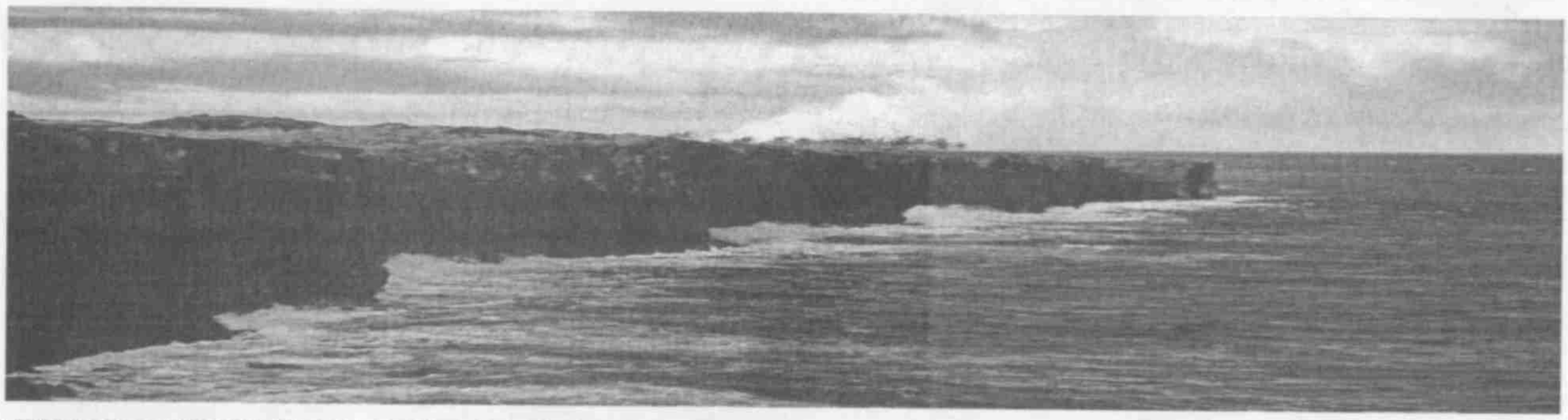
R. F. Davis, *Director*

The Materials Research Center was established in 1984 at NC State as an interdisciplinary program involving persons representing the Departments of Chemistry, Electrical and Computer Engineering, Materials Science and Engineering, and Physics. The principal thrust area of the center involves fundamental studies in the epitaxy of compound semiconductors. The center serves as a focal point for this cooperative research. However, the experimental efforts are conducted within the four departments noted above.

SEA GRANT COLLEGE PROGRAM

R. Hodson, *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 Seat Grant also has regional offices in three coastal communities. Sea Grant combines the University's 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 researchers and through two North Carolina fellowships and two national fellowship programs.



WATER RESOURCES RESEARCH INSTITUTE

K. H. Reckhow, *Director*

The Water Resources Research Institute is a unit of the University of North Carolina System and is located on the campus of NC State.

The institute was established to promote a multi-disciplinary attack on water problems, to develop and support research in response to the needs of North Carolina, to encourage strengthened educational programs in water resources, to coordinate research and educational programs dealing with water resources, and to provide a link between the state and federal water resources agencies and related interests in the University. Research and educational activities are conducted through established departments and schools of the university system. All senior colleges and universities in North Carolina are eligible to participate in the institute's research program.

MCKIMMON CENTER FOR EXTENSION AND CONTINUING EDUCATION (MCE&CE)

www.mckimmon.ncsu.edu

Denis S. Jackson, *Assistant Vice Chancellor for Extension and Engagement*
Alice S. Warren, *Associate to the Assistant Vice Chancellor for Extension and Engagement*

As the "outreach arm" of the Provost's office, the McKimmon Center for Extension and Continuing Education (MCE&CE) provides access to the academic resources of the campus by non-traditional students and other audiences. MCE&CE units develop, facilitate, and link citizens of the state and region to the University via instruction which may be for academic credit or non-credit, on- or off-campus, day and night.

Units within MCE&CE assist in the identification of educational needs, develop relevant programming in conjunction with the faculty, departments, colleges and external constituents, facilitate the registration and advising of individuals, provide quality events management and program support services, and evaluate the outcomes.

The McKimmon Center for Extension and Continuing Education:

- Administers the Lifelong Education (LLE) student program for adult, non-degree students.
- Manages the University's Summer Sessions
- Partners with DELTA to provide student services for registrants in distance education courses and programs.
- Develops and customizes non-credit continuing education programs to meet the professional development or training needs of business/industry, governmental agencies and non-profit organizations.
- Provides a wide array of software-specific and certification courses for individuals and teachers.
- Manages the McKimmon Conference and Training Center, which is a large, flexible facility, dedicated to hosting 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 research evaluations and survey research outcomes, technology application and customized consulting services for federal, state, local, and non-profit agencies.
- Manages the academic performance assessment of public school students.
- Serves as the campus provider of Continuing Education Units (CEUs).

CONTINUING AND PROFESSIONAL EDUCATION

Judson Hair, *Director*
Phone: 919/515.2261

In keeping with the land grant tradition of the university, Continuing and Professional Education offers 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 and problem solving exercises as well as displays, and presentations from experts in a wide variety of fields. 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 recording system to provide a uniform measure of attainment in non-credit educational programs.

COMPUTER TRAINING UNIT

Betty Gardner, *Assistant Director*
Phone: 919/515.8163

Since 1989, the NC State Computer Training Unit has been meeting the IT needs of the Triangle. Currently under the leadership of Betty Gardner, the CTU has grown from 3 offices to 5 training sites in the Raleigh area. Under Ms. Gardner's direction, new classes are introduced on a quarterly 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 committing himself or herself to eight weeks of certification training, the Computer Training Unit is the destination. The certifications currently offered include industry favorites from vendors such as Microsoft, Oracle, Cisco, CIW and Sun as well as newer programs like Character Animation and BioInformatics. By keeping pace with today's technology trends, the Computer Training Unit has introduced programs specifically for K-12 educators with it's NC TEACH-IT program as well as courses offered to Raleigh's growing Hispanic community with instruction in the Spanish language.

The NC State Computer Training Unit strives to meet the needs of each student. With a hands-on approach to technology, they provide quality training and career guidance to each participant. All students will walk away from their experience knowing the material and feeling confident in their understanding.

Visit the NC State Computer Training Unit website today at www.ncsu.edu/ctu for a complete course schedule, certification information and career opportunities.

THE MCKIMMON CONFERENCE AND TRAINING CENTER

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. 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 and other technical services are available to enhance the total learning experience in a new video production room.

OFFICE OF PROFESSIONAL DEVELOPMENT

Chip Futrell, *Assistant Director*
www.ncsu.edu/cpe/
Phone: 919/515.8179

The Office of Professional Development (OPD) develops, promotes, and facilitates noncredit seminars, workshops, and conferences to a broad market on a wide range of topics. Programs include: agriculture, communication, data processing, economics, education, engineering, forestry, management, the physical sciences, recreation, textiles, and veterinary medicine.

NCSU LIBRARIES

S. K. Nutter, *Vice Provost and Director*
J. M. Brotherton, *Associate Director for Administration and Advancement*
K. R. Brown, *Assistant Director for Planning and Research*
C. D. Argentati, *Associate Director for Public Services*
K. A. Antelman, *Associate Director for Information Technology*
N. G. Vaupel, *Assistant Director for Scholarly Communication and External Relations*
W. L. Scott, *Assistant Director for Organizational Learning and Design*
J. H. Kemp, *Associate Director for Collection Management, Organization and Preservation*

The NCSU Libraries consists of the D. H. Hill Library and four branch libraries. The branch libraries - The Burlington Textiles Library in the College of Textiles, the Harry B. Lyons Design Library in Brooks Hall, the Natural Resources Library in Jordan Hall, and the Veterinary Medical Library in the College of Veterinary Medicine- serve the special needs of their respective colleges. Also affiliated with the NCSU Libraries are the Learning Resources Library in Poe Hall and the African American Cultural Center Reading Room in the Witherspoon Student Center Annex. The D. H. Hill Library operates a 24-hour schedule during the fall and spring semesters.

The NCSU Libraries hold more than 3.1 million volumes of books, bound journals, and federal government publications, over 47,000 print and electronic serials, and over 5.0 million microforms. Collections strengths are in the biological and physical sciences, engineering, agriculture, forestry, textiles, and architecture, with the arts, humanities, and social sciences also well represented. The NCSU Libraries has been a depository for U. S. government publications since 1924 and receives over 80 percent of these publications. The library is also a partial depository for N. C. government documents.

NCSU Libraries' website is www.lib.ncsu.edu/. This extensive web site provides information about the Libraries' collections and services, as well as serving as a gateway to Internet resources and databases that support the university curriculum. Numerous bibliographic and full-text databases in all disciplines are also available through the Libraries' web site from on- and off-campus locations. An online catalog permits rapid identification of materials in the collections of the NCSU Libraries as well as those of Duke University, UNC-Chapel Hill, and N. C. Central. An automated circulation system gives users a quick and easy way to checkout materials. Through the web-based electronic-reserve service, students can obtain course readings and other materials that supplement classroom instruction.

Digital library services include the availability, via e-mail or web, of reference assistance and interlibrary loan request forms. MyLibrary@NCState, available at www.my.lib.ncsu.edu, is a customized interface to the library's information resources. Resource sharing, made possible through Libraries' participation in the Triangle Research Libraries Network (TRLN), includes a delivery service for NC State clients and greatly enhances the research capabilities of the NCSU Libraries. A digital media laboratory in the D. H. Hill Library offers equipment and assistance for creating and converting digital images and other materials. Students may also borrow PC and Macintosh laptop computers for in-building use.

Facilities and equipment are available for both individual and group use of audiovisual media. The libraries have a large collection of video, audio, and multimedia titles for individual and class use. The Libraries' Media Center is equipped with audio and video equipment in carrels for group and individual viewing and listening.

ADULT CREDIT PROGRAMS AND SUMMER SESSIONS

B. L. Puryear, *Director*
Phone: 919/515.2265www.ncsu.edu/acp/

Adult Credit Programs and Summer Sessions (ACP&SS) provides access to the University's courses and programs to individuals who are unable due to time, location, and other restraints to take advantage of full-time, on-campus study.

- Adult students in the Triangle area register through ACP&SS as Lifelong Education (non-degree) students on a part-time basis into day and evening classes. ACP&SS promotes this opportunity to area citizens and provides advisement, registration, and referral services to registrants. Approximately nine percent of the University's head count is made up of this population--many of whom eventually matriculate as regular, degree-seeking students.
- ACP&SS plays a key role in the overall administration of NC State's many and varied distance education courses and programs. Student services to registrants at-a-distance are coordinated through ACP&SS. Over 2000 individuals register each semester in courses delivered across North Carolina and beyond, utilizing a variety of delivery mechanisms.

- ACP&SS administers NC State's Summer Sessions in which over 900 classes are taught to more than 13,000 students during two five-week sessions and a ten-week session. The Summer Sessions are designed to meet the needs of NC State's own degree-seeking students as they make progress toward completing their degrees. The Summer Sessions also attract a number of summer visitors from other colleges and universities who are drawn here by the breadth and depth of the course offerings.
- The ACP&SS has a staff of professional advisers who assist nontraditional students in their transition into university life. Academic advising, placement testing in mathematics, and career assessment services are provided.

ACADEMIC COMPUTING

S. F. Averitt, *Vice Provost for Information Technology*
M. A. Vouk, *Associate Vice Provost for Information Technology*

NC State has a tradition of offering its students a leading-edge academic computing environment. Information technology (IT) 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 is supported by individual colleges and central IT units. Colleges and departments provide computing resources such as computing facilities, computing classes, and academic software specifically for students in their curricula. Many courses involve online components or are offered completely online to students on or off campus.

The Information Technology Division (ITD) designs and supports campus-wide academic computing systems and services that are available to all NC State students. 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 (Linux, Macintosh, Windows and Unix) distributed academic computing system called Unity/Eos, hundreds of software packages available for student use from computing labs, e-mail systems, the Web servers, file space, and friendly IT support staff available to help students and others use the resources available.

All NC State students automatically receive Unity computing accounts (or Eos accounts for engineering students). Unity/Eos 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. 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 ITD 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/Eos computing environment. Colleges and academic departments support additional computing facilities, and overall there are more than 70 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 their 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/itd/essentials/. The ITD Help Desk is in Room 208 of the Hillsborough Building. Check the online Help database at: help.ncsu.edu/ or call 515.HELP (4357) or send email to help@ncsu.edu.

RESEARCH TRIANGLE

NC State is one of the three Research Triangle 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 7,000 acre Research Triangle Park, location of many public research agencies and private research centers of national and international corporations.

The unique "Research Triangle" in North Carolina has captured national and international attention. It is comprised of the Research Triangle Park, a world-renowned research park, and three major research universities. 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 Triangle Universities-- North Carolina State University, the University of North Carolina at Chapel Hill, and Duke University-- have a subsidiary campus in the Research Triangle Park- the Research Triangle Institute. The Institute, which operates as a contract research organization, has an annual research review of approximately $206 million.

The Research Triangle Park, founded in 1959, now has more than 145 private and public industrial research facilities, situated on 7,000 acres of land. Over 45,000 people work in the Park and over 40,000 additional jobs have been created outside the Park as a result of its existence. Organizations in the park include such government facilities as the National Humanities Center, the National Institute of Environmental Health Science, and the Environmental Protection Agency. Private companies such as Glaxo SmithKline, Nortel Networks, and Cisco Systems are located in the Park. Faculty and companies like Glaxo SmithKline, IBM, and BD Technologies frequently hold adjunct appointments in one or another of the Triangle Universities.

RESEARCH CENTERS AND FACILITIES

ANIMAL AND POULTRY WASTE MANAGEMENT CENTER

C. M. Williams, *Director*

The Animal and Poultry Waste Management Center establishes partnerships among universities, agribusiness and other organizations to address waste management concerns. Partner universities are Auburn, Georgia, Iowa State, Kentucky, Michigan State, Mississippi State, Missouri, Ohio State, Oklahoma State, Oregon State, and Virginia Polytechnic Institute; commodity groups are also members. 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 water quality associated with animal waste management. Other Center work includes 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 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. It now includes the SRC/SEMATECH Research Center program on Front End Processes for advanced semi-conductor devices. 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 nandometer scale electronic devices. The program emphasizes rapid-thermal and low temperature processing of new materials. It is a joint effort involving researchers from eight other major US research universities. Undergraduate Scholar Awards are available for qualified undergraduates with interest in electronic materials and devices.

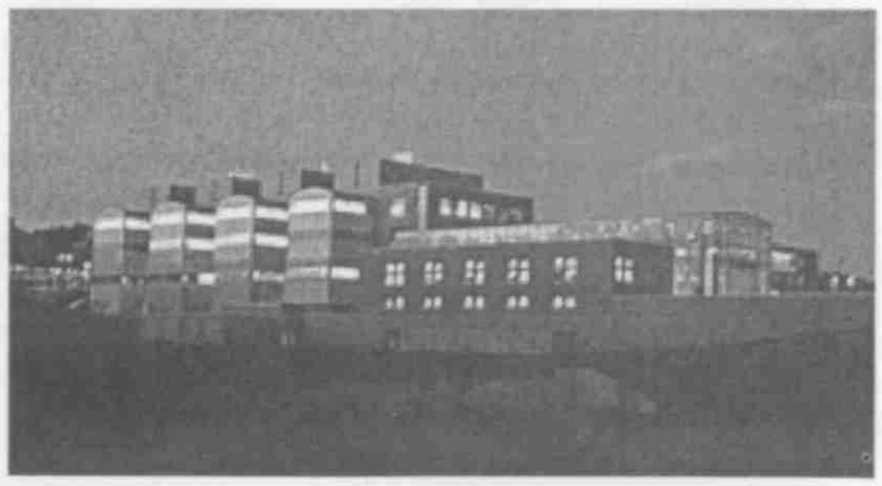
CENTER FOR ADVANCED PROCESSING AND PACKAGING STUDIES

K. R. Swartzel, *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 ADVANCED COMPUTING AND COMMUNICATION

Dennis Kekas, *Director*



The Center for Advanced Computing and Communication (CACC) is a National Science Foundation (NSF) sponsored Industry/University Cooperative Research Center with research sites at NC State University and Duke 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 also work closely with each member's technical staff on a variety of research projects. Current members include CipherOptics, Cisco Systems, Ericsson, IBM, ISIC Corporation, Nortel Networks, Naval Surface Warfare Center, National Security Agency and Telcorida technologies.

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. CACC is uniquely equipped to serve as a test bed for new networking hardware, software, and protocols because of its state-of-the-art Networking, Multimedia and Imaging Laboratories.

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. 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.

CENTER FOR RESEARCH AND DEVELOPMENT IN MATHEMATICS AND SCIENCE EDUCATION

S. B. Berenson, *Director*
Glenda S. Carter, *Associate Director*

The center, one of ten centers in the North Carolina Mathematics and Science Education Network, is the only research and development center in the network. Established in 1984, the center is in the Department of Mathematics and Science Education, and conducts research and development activities for precollege students, pre-service teachers, in service teachers, and University faculty. The center identifies areas in need of mathematics and science education and forms partnerships with federal, state, local, and private funding agencies to work collaboratively to address the needs. Grants have been obtained from the National Science Foundation, Office of Education, State Department of Public Instruction, Local Education Agencies, the Ford Foundation, and IBM to introduce changes that incorporate technology and active learning into the mathematics and science curriculum, K-16. In addition, the center supports graduate students and provides them with opportunities to write grants and to design, conduct, and report on educational research.

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

J. S. Fisher, *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 by the U. S. Department of Transportation, with matching monies from 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: itre.ncsu.edu/cte.

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 four 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, the Engineering Research Microscope Facility is in Burlington Engineering Labs, and the Department of Wood and Paper Science Electron Microscopy Lab is in Biltmore Hall. 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 two scanning microscopes: a Philips 505T and JEOL 5900LV which has low vacuum capabilities and two transmission electron microscopes: a JEOL 100S and a Philips 400T-STEM. The Philips microscope is equipped with a C400M computer control system, which includes a five-axis computer controlled stage. Both scanners are equipped with all of the necessary biological, preparatory equipment including cyro-sectioning and a Balzers freeze-etch apparatus.

The Center provides advanced, digital imaging capabilities. All computers including those on dedicated instruments are networked to two high-speed servers and to our University system. We provide access for Macintosh, PC and UNIX based systems allowing transparent information transfer regardless of user's platform preference. Our servers provide support for both Windows NT and Novell Clients.

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 ENGINEERING RESEARCH ANALYTICAL INSTRUMENTATION FACILITY (AIF)

P. E. Russell, *Director, Engineering Analytical Instrumentation Facility*

The Engineering Research 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, 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 Engineering Graduate Research Center on the NCSU 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 Environmental Scanning Electron Microscope (ESEM), which can operate at near atmospheric pressure, gives AIF the capability of providing electron microscopy and EDS (Energy Dispersive X-Ray Spectroscopy) elemental analysis on wet, oily, and/or non conductive samples including biological, polymeric, textile, and other materials. The ESEM facility is extensively used by undergraduate students in a wide range of disciplines. AIF has extensive capabilities in the areas of Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Field Emission Scanning Electron Microscopy (FESEM), Scanning Transmission Electron Microscopy (STEM), Secondary Ion Mass Spectrometry (SIMS), X-Ray Photoelectron Spectrometry (XPS), Auger Electron Spectrometry, (AES), Focus Ion Bean micromachines (FIB), and metallography. In addition, AIF has extensive facilities for specimen preparation and digital photography for the physical sciences.

THE CVM LABORATORY FOR ADVANCED ELECTRON AND LIGHT OPTICAL METHODS

M. J. Dykstra, *Director, CVM Laboratory for Advanced Electron and Light Optical Methods*

The CVM Laboratory for Advanced Electron and Light Optical Methods (CVM-LAELOM) is a full-service facility providing clinical and research support for the CVM as well as the full NC State campus. The CVM-LAELOM houses a Phillips EM208S transmission electron microscope and a JOEL 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 materials. The darkroom facility contains equipment for user-produced prints, 2 x 2 slides, 4 x 5 copy negatives, publication prints, posters, and film development. In addition, the CVM-LAELOM offers the use of an Olympus VANOX compound light microscope equipped for bright field, epiflourescence and polarizing microscopy. A morphometry, digitizing and archiving package is coupled to the VANOX. A Wild photomacroscope is also available for viewing and photographing larger specimens with bright- and dark-field optics.

INSTITUTE OF STATISTICS

Sastry G. Pantula, *Director*

The Institute of Statistics is composed of two sections, one in Raleigh and the other in Chapel Hill. At NC State, the institute provides extensive collaborative and advisory services in experiment design, data management, data analysis, mathematical modeling and statistical computing to the University community and beyond. The institute has interactions with state and federal agencies and with private industries.

INSTITUTE FOR TRANSPORTATION RESEARCH AND EDUCATION

Nagui Rouphail, *Director*

The Institute for Transportation Research and Education conducts research and training for numerous public agencies at the federal, state, and local levels of government and for some private firms. Established in 1978, the Institute conducts programs in public transit operations, highway operations, transportation finance, geographical information systems, pupil transportation, and technology transfer. The Institute is also the home of the Center for Transportation and the Environment, a prominent national research facility.

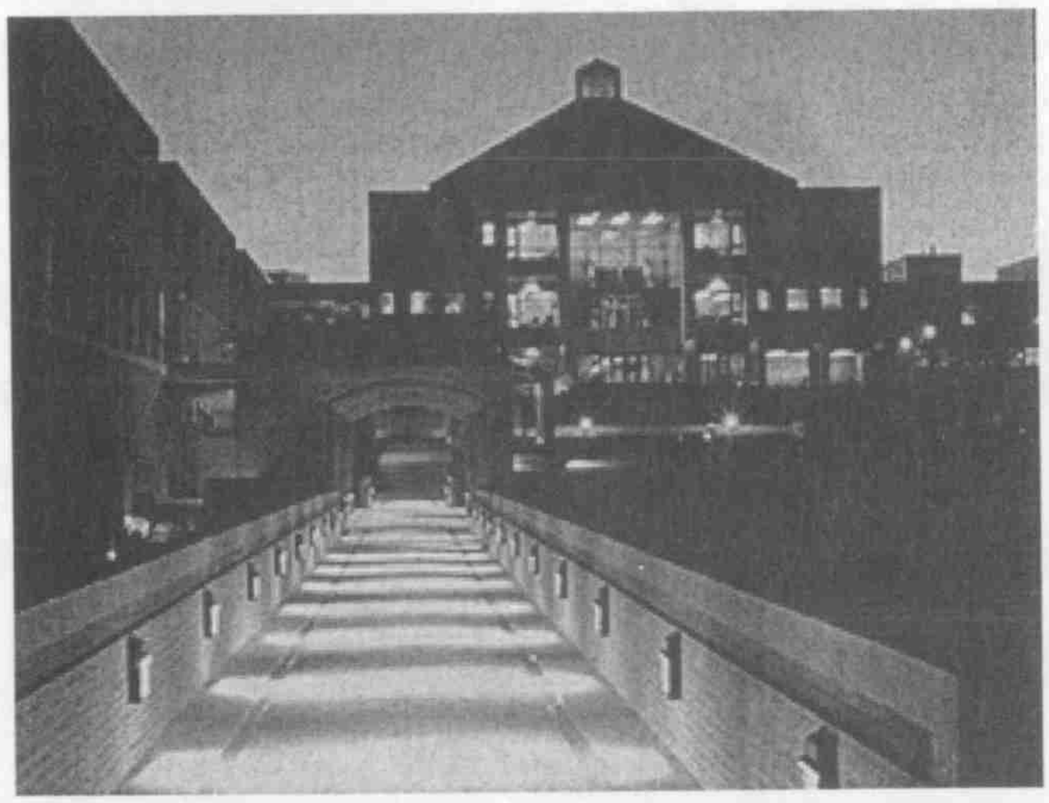
INTEGRATED MANUFACTURING SYSTEMS ENGINEERING INSTITUTE

T. J. Hodgson, *Director*

The Integrated Manufacturing Systems Engineering Institute was established at NC State in 1984 to provide a multifaceted educational, research, and technology transfer initiative in manufacturing systems engineering. The objectives of this program are to educate engineers in the theory and practice of advanced design and manufacturing methods at the master's degree level; to conduct basic and applied research on topics related to contemporary manufacturing problems; and to engage in technology transfer to increase productivity and improve the quality of manufactured products.

The central goals of the institute are to integrate computer-aided processes into the design and control of manufacturing facilities enabling them to produce manufactured goods of improved quality at lowered cost, and to develop logistics systems that improve the flow of goods through the entire manufacturing supply chain. Through both internally and externally funded research projects the institute helps solve generic manufacturing systems engineering problems and provides a vehicle for technology transfer.

NONWOVENS COOPERATIVE RESEARCH CENTER



B. Pourdeyhimi, *Director*

Nonwovens Cooperative Center (NCRC) was established in 1991 and has been funded by National Science Foundation (NSF), State of North Carolina and industrial membership. The NCRC is located at the College of Textiles in 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 program 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 BS, MS, and Ph.D. degrees. Faculty members from NCSU, Georgia Tech, Clemson University, University of Tennessee, etc., are involved in several research projects funded by NCRC.

Major industrial members include DuPont, Freudenberg, PGI, P&G, 3M, Albany International, Cotton, Inc., Wellman, Goulston, Fiber Visions, Fiber Innovation Technology, Kimberly Clark, Kosa, J. D. Hollingsworth, CHA Technologies, and INDA.

NUCLEAR SERVICES

Scott Lassell, *Manager*

Specialized nuclear service facilities are available to the University faculty, students, state and federal agencies, and industry. The purpose of these facilities is to further the use of nuclear technology in engineering research and in scientific and public service programs. The facilities include: a 1 megawatt steady-state, pool-type, nuclear research reactor (PULSTAR) with a variety of test facilities; a neutron activation analysis and radioisotope laboratory; a prompt gamma facility; a neutron radiography facility and a low level counting laboratory equipped with liquid scintillation systems and alpha spectrometry systems.

Nuclear Services also provides short courses in radioactivity usage, and laboratory experiments for related courses in other departments.

The 50,000 square-foot Burlington Engineering Laboratories complex houses the Department of Nuclear Engineering and the Department of Materials Science and Engineering with their associated offices and laboratories. All of the facilities including the Pulstar reactor are on the NC State campus.

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 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. Contact Ray Fornes, 919/515.7865 for more information about ORAU programs or see www.orau.org.

PLANT DISEASE AND INSECT CLINIC

Tom Melton, *Director*

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 Plant Pathology and Entomology Departments. The PDIC receives approximately 3,500 problem samples each year. County Agents, Extension Specialists 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.

Rapid changes in agricultural technology influence the range of pest problems encountered and require new types of assays and more sophisticated laboratory examinations. 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.

PRECISION ENGINEERING CENTER

Thomas A. Dow, *Director*

The Precision Engineering Center, established in 1982, is a multidisciplinary research and graduate engineering program dedicated to providing new technology for high precision manufacturing. It encompasses measurement and fabrication of optical, electronic, or mechanical devices where the tolerances required for operation are on the order of 1 part in 100,000; that is, for a 25mm (1 inch) long part the error must be less than 250nm (250×10^{-9}). Components that need 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.

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 a 4-MeV Van de Graaff accelerator. 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.

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 Web site at www. ncsu.edu/univ_relations/univadv.

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 Endowment Fund Board, and the Alumni Association business operation.

The Office of Alumni Relations strives to involve alumni in the life of NC State University and to perpetuate their pride in their alma mater by communicating the university's achievements and distinctions. Alumni Relations offers a premier membership program that provides a host of benefits to those who join; organizes alumni activities such as reunions, tailgates, and area club meetings; arranges lifelong educational opportunities; enriches student experiences with activities such as homecoming and senior recognition; supports the prestigious Caldwell Alumni Scholarship Program, and provides alumni services such as insurance, a credit card, and NC State apparel. Through the pages of NC State, the alumni magazine, and a multi-faceted website, Alumni Relations promotes the university with information about notable alumni and university achievements. Students and parents are invited to visit the Office of Alumni Relations, located in the Alumni Memorial Building on Pullen Road. To inquire about these programs or service, call 919/515.3375 or 800/NCS.ALUM; visit the website at 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 gift planning, corporate and foundation relations and the annual fund. 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 news stories and briefings. Creative Services provides publications and Web site 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, staging special events for University Advancement and the Chancellor's Office, and working closely with the Chancellor's Office on external affairs projects.

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. North Carolina State University is one of the 16 constituent institutions of 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.

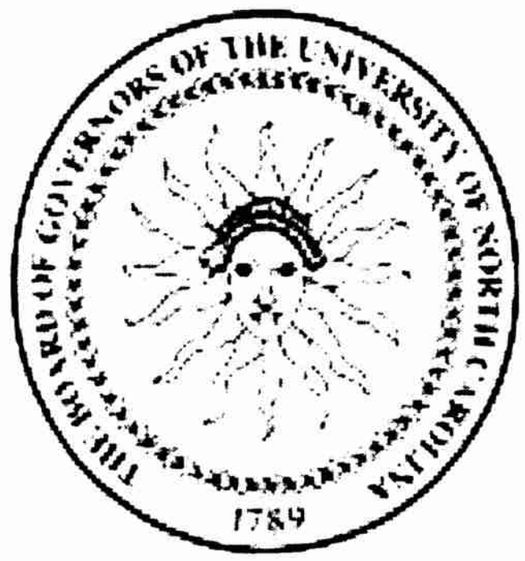
In 1877, the N.C. General Assembly began sponsoring additional institutions of higher education, diverse in origin and purpose. Five were historically black institutions, and another was founded to educate American Indians. Several were created to prepare teachers for the public schools. Others had a technological emphasis. One was 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 Women'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; and in 1996, Pembroke State University was renamed The University of North Carolina at Pembroke through legislative action.)

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 for 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.



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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.

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.

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.

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 mini mum 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 mini mum 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.

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.

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.

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COURSE DESCRIPTIONS

The courses listed in this catalog are planned for the academic year 2003-2004 unless indicated.

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, indicated 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 at the 500-800 level are graduate courses, but 500-level courses are open to advanced undergraduate students, unless otherwise specified. Graduate standing is a prerequisite for all 500-level courses.

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.

Other abbreviations used in the course descriptions are: grad., graduate; undergrad., undergraduate; sr., senior; jr., junior; soph., sophomore; fr., freshman; lab, laboratory; lect., lecture; and sem., seminar.

COURSE CODES

AC	Agricultural Communications
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
AS	Aerospace Studies
BAE	Biological & Agricultural Engineering
BCH	Biochemistry
BIO	Biological Sciences
BIT	Biotechnology
BME	Biomedical Engineering
BO	Botany
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	Physical Education- Dance
DF	Design Fundamentals
DN	Design
E	Engineering
EC	Economics
ECD	Counselor Education
ECE	Electrical and Computer Engineering
ECI	Curriculum and Instruction
ED	Education
EDP	Educational Psychology
ELP	Educational Leadership & Program Evaluation
EMS	Mathematics/Science/Technology Education
ENT	Entomology
EOE	Occupational Education
ES	Environmental Science
ET	Environmental Technology
FL	Foreign Languages & Literatures
FLC	Foreign Languages & Literatures- Chinese
FLE	Foreign Languages & Literatures- English
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
HA History of Art
HI History
HON Honors
HS Horticultural Science
HSS Humanities and Social Sciences
ID Industrial Design
IE Industrial Engineering
LAR Landscape Architecture
LAT Foreign Languages and Literature- Latin
LOG Logic
M Management
MA Mathematics
MAE Mechanical and Aerospace Engineering
MAT Materials Science and Engineering
MB Microbiology
MDS Multidisciplinary Studies
MEA Marine, Earth, and Atmospheric Sciences
MS Military Science
MUS Music
NE Nuclear Engineering
NR Natural Resources
NS Naval Science
NTR Nutrition
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
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
SW Social Work
T Textiles
TAM Textile and Apparel Management
TC Textile Chemistry
TE Textile Engineering
TED Technology Education
TMS Textile Materials Science
TOX Toxicology
TT Textile Technology
VMF Veterinary Science
VMS Veterinary Science
WGS Women's and Gender Studies
WPS Wood and Paper Science
ZO Zoology

AGRICULTURAL COMMUNICATIONS

AC 485 Natural Resources Advocacy. *3(2-3-0). S. Preq: ENG 321.* Analysis of natural resources problems as they affect management agencies and user groups. Development of professional attitudes, policies, and skills needed for the management of sensitive natural resource issues through application of techniques in the field. Student presentations, demonstrations and development of natural resource planning models that integrate biological skills with management alternatives and are critiqued by resource field staff.

ACCOUNTING

ACC 100 Introduction to Accounting Profession. *1(1-0-0) F.* Introduction to an accounting degree at NC State and the accounting profession, including career opportunities, certifications, professional organizations, required business skills, and ethics.

ACC 210 Accounting I 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 accounting cycle, income measurement, and internal controls.

ACC 211 Fundamentals of Accounting. *1(1-0-0). F,S,Sum. Coreq: ACC 210.* This course will introduce students to the technical aspects of accounting, basic accounting procedures, the accounting cycle, business transactions and financial statement preparation. Use of special journals and subsidiary ledgers, income statement and balance sheet concepts and standard setting.

ACC 220 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 310 Intermediate Financial Accounting I. *3(3-0-0). F,S,Sum. Preq: ACC 211 with a grade of C- or better.* Measurement and reporting issues related to cash, accounts receivable, inventories, operating and intangible assets, current and noncurrent liabilities, and stockholders' equity.

ACC 311 Intermediate Financial Accounting II. *3(3-0-0) F,S,Sum. Preq: ACC 310 with a grade of C- or better.* Theory and professional standards for analyzing and reporting financial topics beyond the balance sheet. Measurement and reporting issues related to leases, pensions, deferred taxes and cash flows are examined.

ACC 320 Managerial Uses of Cost Data. *3(3-0-0). F,S,Sum. Preq: ACC 220 with grade C- or better, M 200,MA 121 and MA 132 or equivalent, PHI elective, and EC 201. Coreq: BUS 350 and ENG 331 or 332 or 333.* Managerial uses of cost data in planning, controlling, and evaluating organizational activities and in making business decisions. Budgeting, cost behavior, product costing and pricing, and decision-making frameworks.

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 An Introduction to Accounting Information Systems. *1(1-0-0). F,S. Preq: ACC 211 and ACC 220, both with a grade of C- or better. Coreq: BUS 340.* Concepts in analysis, design, and development of accounting information systems. Emphasis on use and evaluation of accounting information systems and how they interface with management information systems.

ACCOUNTING - Continued

ACC 407 Business Law for Accountants. *3(3-0-0). F,S,Sum. Preq: EC 201 or ARE 201. Credit may not be received for ACC 407 and any of the following: BUS 305, BUS 307, or ARE 306.* Legal principles affecting the conduct of trade related to accountants. Personal and real property; contract law; negligence and accountants legal liability; business and the Constitution.

ACC 410 Governmental and Nonprofit Accounting. *3(3-0-0). F,S. Preq: ACC 211.* 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 220 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 Accounting Information Systems. *3(3-0-0). F,S,Sum. Preq: BUS 340 and ACC 340, both with a grade of C- or better.* Introduction of accounting-related design issues and internal control solutions to mitigate risks related to emerging information technologies (IT) and e-commerce systems. Focus on issues related to designing IT functions that incorporate effective general controls to manage IT within an organization, modeling key IT-based processes, and developing IT applications and information systems that include effective automated controls.

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. 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.* 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.

ACC 490 Senior Seminar in Accounting. *3(3-0-0). S. Enrollment in this course is restricted to accounting majors in their final semester of study. PBS students 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.

ACCOUNTING - Continued

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.

ART & 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. This course is not open to College of Design students.* 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 design principles and a language of design.

ADN 112 Three Dimensional Design for Non-Design Majors. *3(0-6-0). F,S. This course is not open to School of Design students.* 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 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.

ADN 272 Printed Textile 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. Open only to College of 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.

ART & DESIGN - Continued

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 and oil 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: DF 102 or written approval of Department Head and Dean.. Course may be used to partially satisfy studio requirement in all undergraduate degree programs in the College of Design.* Studio offering upper-level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.).

ADN 402 Design Studio: Practice and Technology. *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. May be taken for a minimum of 12 credit hours by College of Design students.* Visual communication skills in the areas of life drawing, illustration, painting, print making and sculpture.

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. Preq: DF 102.* 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: College of Design students only. History of Art I & II or junior standing.* 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 the fields 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. College of Design students; Minors in Design or permission of instructor.* 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 textile media. Specific focus changes each semester.

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. Acrylic and oil paint are used; Projects have assigned and open themes.

ART & DESIGN - Continued

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, College of Design or equivalent program. 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. Maximum of 6 credit hours.* Supervised field experience in design offices, galleries, museums and other organizations.

ADN 495 Independent Study in Design. *1-6. F,S. Preq: Junior standing in Design with 3.0 in Design or better.. Maximum 6 credit hours.* Special projects in art and design developed under the direction of a faculty member on a tutorial basis.

AGRICULTURAL & EXTENSION EDUCATION

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) 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 112.* 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. *2(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 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 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 or Consent of Instructor.* 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) 426 Methods of Teaching Agriculture. *3(2-2-0) F. Preq: Jr. standing or Consent of the Instructor.* 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) 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 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 or PBS.* 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 (ED) 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.

AGRICULTURAL & EXTENSION EDUCATION - Continued

AEE 492 External Learning Experience in Agricultural and Extension Education. *1-6. F,S,Sum. Preq: Sophomore standing. Not intended for teaching licensure for students in AEE.* 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.

AEE 493 Special Problems in Agriculture and Extension Education. *1-6. F,S,Sum. Preq: Sophomore Standing. Not intended for teacher licensure for students in AEE.* 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.

AEE 495 Special Topics in Agricultural and Extension Education. *1-3. F,S,Sum. Not intended for teacher licensure for students in AEE.* Offered as needed to present material not normally available in regular course offerings or for offerings of new courses on a trial basis.

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 (MDS) 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 Monomotapa.

AFS (MDS) 241 Introduction to African-American Studies II. *3(3-0-0). F,S,Sum.* Second in a two semesters sequence in the interdisciplinary study of sub-Saharan Africa, its arts, culture, and people, and the African-American experience.

AFS (COM) 243 African-American Theater. *3(3-0-0). S.* African-American dramaturgy and its impact on the American theater; plays from the nineteenth century to the present.

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 (MDS) 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 (MDS) 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 (MDS) 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 (MDS, 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 and an African-centered world view. Discussion of contemporary issues within the African American community.

AFS (MDS) 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.* 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 111Z or 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 (MDS, 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 (MDS) 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 or permission of instructor. Credit will not be given both for HI 455 and HI 555.* 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.

AFS (HI) 475 History of the Republic of South Africa. *3(3-0-0). F,S. Preq: 3 hours of history. Credit will not be given for both HI 475 and HI 575.* 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.

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. Credit will not be given for both HI 479 and 579.* 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.

AFS (MDS) 497 Topics in African-American Studies. *3(3-0-0). F,S. Preq: MDS 240.* Multidisciplinary examination of selected topics in African-American studies.

AGRICULTURE & LIFE SCIENCES

ALS 103 Introductory Topics in Agriculture and Life Sciences. *1(1-0-0). F,S. Not open to juniors and seniors.* 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 Agriculture and Life Sciences Scholars Forum. *0(2-0-0). F. Preq: Enrollment limited to participants in the Agriculture and Life Sciences 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.

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 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 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. A maximum of 6 credits for ALS 498 & ALS 499 combined.* 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.

ALS 499 Honors Research or Teaching II. *2-4. F,S,Sum. Preq: ALS 498 & GPA 3.25 or higher. A maximum of 6 credits for ALS 498 and ALS 499 combined.* 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.

ANIMAL SCIENCE

ANS 105 Introduction to Companion Animals. *3(3-0-0). F,S. Restricted to Class FR and SO.* 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. Restricted to Class FR and SO.* 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. Major IAS or SAS, or instructor permission.* 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. Major IAS or SAS.* 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. *3(2-2-0). F,S. Preq: ZO 160, BIO 183 or BIO 125; ANS 150.* Basic concepts relating mammalian structure and function with emphasis on livestock species. Fundamentals of neuromuscular activity, digestion, absorption as well as regulation of homeostasis relevant to production of milk, wool, and muscle growth efficiency.

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 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. Food science majors may use as a free elective only.* 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.

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 306 Equine Behavioral Modification. *3(2-3-0). F. Preq: ANS 202. Departmental Approval Required, SAS and IAS majors only.* 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.

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 processed meat 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. Offered only as a world wide web course through the Office of Instructional Telecommunications..* 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.

ANS 400 Companion Animal Management. *3(2-3-0). S. Preq: ANS 230.* 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 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.

ANIMAL SCIENCE - Continued

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: ANS 230, ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415.* Current concepts and physiological bases of the roles of nutrition in the maintenance of health during the different stages in the life cycle and in the prevention and therapy of specific disease states in humans.

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 and 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 or equivalent; junior standing. Credit will not be given for both ANS 453 and 553.* 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.

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. Credit will not be given for both ANS 454 and 554.* 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.

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 teaching coordinator).

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.

ANTHROPOLOGY - Continued

ANT 252 Cultural Anthropology. *3(3-0-0). F,S,Sum.* Comparative study of contemporary human culture, social institutions and processes that influence behavior. Includes examples from cultural backgrounds and the student's own culture 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 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 373 The Human Fossil Record. *3(3-0-0). Preq: Three hours physical anthropology or archaeology.* Analysis of the human fossil record and consideration of alternate theories of human evolution.

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. Coreq: Students cannot receive credit for both ANT 411 and ANT 511.* 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.

ANT 412 Applied Anthropology. *3(3-0-0). S. Credit cannot be given for both 412 and 512.* 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.

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 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. 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 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 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. Course open only to B.A. in Anthropology students.* 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. Coreq: ARC 162. Undergraduate Architecture majors only.* 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 141 History of Design I. *3(3-0-0). F.* Western design from prehistory to Imperial Rome through examples of architecture and construction, landscape and urban planning, pure and applied three- and two-dimensional artifacts in their cultural setting. Students draw and/or construct selected historical design solutions.

ARC 142 History of Design II. *3(3-0-0). S.* Western design from the early Christian to the Modern Age through examples of architecture and construction, landscape and urban planning, pure and applied three- and two-dimensional artifacts in their cultural setting. Students draw and/or construct selected historical design solutions.

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 251 Architectural Representation. *3(2-2-0). F. Students in EDA program.* Historical, theoretical, and methodological investigation of architectural representation including: two- and three-dimensional, traditional media and digital media. Technical projects will introduce the traditional methods of architectural representation and emerging digital technologies and the correlating perceptual and emotive effects.

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. Departmental Approval.* 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.

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 302 Architectural Design: Technology. *6(0-9-0). S. Preq: ARC 202, ARC 232, Architecture majors. Coreq: ARC 332.* An investigation of technical systems of buildings - structure, environmental control/energy, materials, enclosure, and circulation, their fabrication and assembly and their capacity to affect form and tectonic expression 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 400 Architectural Design. *6(0-9-0). F, Sum. Preq: DF 102.* Studies in architectural design. Projects of many types and scales employed to investigate issues in architecture. Emphasis on independent exploration of design values and their implications.

ARC 402 Architectural Design: Integration. *6(0-9-0). S. Preq: ARC 302, ARC 432, ARC 441. Coreq: ARC 414. Bachelor of Environmental Design in Architecture majors only.* 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 403 Architectural Design Fundamentals: Environment. *6(0-12-0). F. Coreq: ARC 211. M. Arch Track 3 Students only.* 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: ARC 403, ARC 252. Coreq: ARC 261. M. Arch Track 3 Students only.* 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 emphasis on electronic media in drawing and modeling.

ARC 405 Architectural Design Fundamentals: Technology. *6(0-12-0). S. Preq: ARC 404. Coreq: ARC 331. M. Arch Track 3 Students only.* 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 capacity to affect form and tectonic expression - are explored as fundamental elements of the design process. Particular emphasis on physical models.

ARCHITECTURE - Continued

ARC 406 Architectural Design Fundamentals: Integration. *6(0-12-0). S. Preq: ARC 405. Coreq: ARC 332, ARC 414, ARC 441. M. Arch Track 3 Students only.* 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, Jr. 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 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 approval of department head.* Special projects in architecture developed under the direction of a faculty member on a tutorial basis.

AGRICULTURAL & RESOURCE ECONOMICS

ARE 201 Introduction to Agricultural & Resource Economics. *3(3-0-0). F,S. Preq: MA 111. Credit will not be given for both EC 205 and either EC 201 or ARE 201.* 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.

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 (EC) 301 Intermediate Microeconomics. *3(3-0-0). F,S,Sum. Preq: MA 121 or 131; ARE 201 or EC 205 or EC 201. Credit not allowed for both EC(ARE) 301 and EC(ARE) 401.* 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.

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. Credit for both ARE 306 and BUS 307 is not allowed.* 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.

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 (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 climate change, 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. 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.* 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.

ARE 403 Economics of Consumer Decisions. *3(3-0-0). Alt. yrs. Preq: ARE 201 or EC 201. 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.* 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.

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: Consent of the Department.* Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis.

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: Departmental Approval Required.* 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: Departmental Approval Required.* 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: Department approval required.* 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: Departmental Approval Required.* 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 & AGRICULTURAL ENGINEERING

BAE 100 Introduction to Biological and Biomedical Engineering. *1(0-2-0). S.* Technical topics and career options in Biomedical Engineering and 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 4-year Plans of Study.

BAE 121 Computer Applications in Agriculture and Life Sciences. *3(1-4-0). F,S.* Operation of computers and applications to agricultural and environmental systems. Hands-on experience with following software: word processing, electronic spreadsheet, database management, equation solver, presentation graphics and on-line information systems. Individual term project in agricultural and environmental systems.

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 operations and procedures.

BAE 202 Introduction to Biological and Agricultural Engineering Methods. *3(1-0-4). S. Preq: BAE 101, GC 120.* Basic design and problem solving methodology 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 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, and selection 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 382 Biomedical Engineering Applications. *3(3-0-0). S. Preq: ECE 331; BAE 381. BEM and BME majors only.* Introduction to the field of biomedical engineering. Topics include biomedical sensors, biomaterials, bioelectricity, bioinstrumentation, tissue engineering, imaging modalities, signal processing, and other subspecialities in the field. Major team project required.

BAE 401 Bioinstrumentation. *3(2-3-0). F. Preq: ECE 331, MA 341. Credit will not be given for both BAE 401 and BAE 501.* Concepts of instrumentation for making, measuring and controlling biological systems. Transducers and control circuits utilized in biological and agricultural engineering work. Electronic models used to demonstrate concepts of errors, accuracy and precision, linearity and other instrumentation characteristics. Laboratories provide hands-on experience for reinforcing lecture concepts.

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.* 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 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 (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: 12 hours BAE courses 300 level or above and within 36 credit hours of completing the degree..* 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.

BAE 452 Engineering Design II. *3(0-6-0). 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. Machinery design of agricultural field equipment and other agricultural machinery systems.

BAE 471 Land Resources Environmental Engineering. *3(2-2-0). F. Preq: SSC 200. Coreq: 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. Credit will not be given for both BAE 472 and BAE 572.* Design, management and evaluation of irrigation and drainage systems; concepts and processes of system design.

BAE 473 Introduction to Surface/Water Quality Modeling. *3(3-0-0). S. Preq: BAE 471 and SSC 200. Credit will not be given for both BAE 473 and BAE 573.* 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.

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 animals and plants to their environment, applications of heat transfer and psychrometrics in calculating ventilation requirements, heating or cooling loads.

BAE 485 Bioelectricity. *3(3-0-0). S. Preq: BAE 381; BAE 401 or equivalent instrumentation course. Senior or Graduate standing; Credit not given for both BAE 485 and BAE 585.* 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, subthreshold stimuli, extracellular fields, membrane biophysics, and electrophysiology of the heart. Design and development of an electrocardiogram analysis system.

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,Sum. 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.

BIOCHEMISTRY

BCH 150 Introductory Biochemical Concepts. *2(2-0-0). S. Preq: Enrollment limited to freshmen and sophomores 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 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 or permission of instructor. Credit is not allowed for both BCH 453 and BCH 553.* Structure and function of nucleic acids and proteins. Synthesis of DNA, RNA, and proteins. Gene expression and Regulation. Methodologies of recombinant DNA research.

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.

BIOLOGICAL SCIENCES

BIO 105 Biology in the Modern World. *3(3-0-0). F,S,Sum. For non-science students. Students may not receive credit for both BIO 105 and BIO 125.* 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.

BIO 106 Biology in the Modern World Laboratory. *1(0-2-0) F,S,Sum. Coreq: BIO 105. For non-science students. Students may not receive credit for both BIO 106 and BIO 125, BIO 181 or BIO 183.* Laboratory experience in biological principles to complement BIO 105.

BIO (Z0) 160 Introduction to Cellular and Developmental Zoology. *4(3-3-0).* 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. Students may not receive credit for both BIO 181 and either BIO 105 or BIO 125.* 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.

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 490 Senior Seminar in Biological Sciences. *1(0-1-0). F,S. Preq: BIO 125 or BIO 105, plus six additional credits in life sciences courses.* Student seminars on selected biological topics of historical or contemporary significance. Discussions of the influences of biological concepts, research methods, and research findings on society.

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 any biological 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 360 Manipulation of Recombinant DNA. *4(2-5-0). F,S. Preq: BIO 125 or BIO 181 or ZO 160 and CH 223 with 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 Microarrays. *2(2-5-0). F, Alt. yrs.(even). Preq: BIT 360 or MB 409 or BCH 454 or ZO 480 and one course in statistics.* Introduction to microarray fabrication, probing, hybridization stations, and scanners. Comparison of cDNA and oligonucleotide arrays. Database management and GATC-compliant databases. Methods of gene profiling and clustering. Half semester course, second part.

BIT 463 Fermentation. *2(2-5-0). S, Alt. yrs.(even). Preq: BIT 360 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 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 466 Animal Cell Culture Techniques. *2(2-5-0). S. Preq: BIT 360 or BIT 810 equivalent.* 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 360 or MB 409 or BCH 454 or ZO 480.* 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. Half semester course, first part.

BIT 468 Genome Mapping. *2(2-5-0). F. Preq: BIT 360 or MB 409 or BCH 454 or ZO 480.* Introduction to genomic mapping. Use DNA markers to generate maps and to map mutations or genetic loci for disease. Introduction to database management for large sets of DNA markers and methods of analyzing recombination frequencies. Applications of genomic mapping and identification of molecular markers for agriculturally and pharmacologically important traits. Half semester course, second part.

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. Project must be approved by the Academic Coordinator or Program*

BIOTECHNOLOGY - Continued

Director of the Biotechnology Program. 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.

BIT 493 Special Problems in Biotechnology. *1-6. F,S,Sum. Preq: BIT 360. Project must be approved by the Academic Coordinator of Program Director of the Biotechnology Program.* 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.

BIT 495 Special Topics. *F,S,Sum. Preq: BIT 360 or equivalent.* 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 102 Introduction to Biomedical Engineering. *1(1-0-0) S. BME majors only.* Technical topics and career options in a variety of fields in Biomedical Engineering are introduced. Information is provided about career services, internships, and study abroad and co-op opportunities. Students work on team-building skills and develop 4-year Plans of Study.

BME 201 Computer Methods in Biomedical Engineering. *3(2-2-0). S. Preq: E 115, MA 241.* Students develop computer-based problem solving techniques 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.

BME 202 Introductory Topics in Biomedical Engineering. *3(3-0-0). S. Preq: BME 201; MAE 206 or CE 214; ZO 160 or BIO 183. Coreq: BME 210, MA 341. BME majors only.* Introduction to the field of biomedical engineering. Topics include brief overview of human anatomy and physiology, biosensors, biomechanics, rehabilitation and clinical engineering, imaging modalities, biosignal processing, ethics, and other contemporary topics in the field. Major team-based project required.

BME 210 Analog & Digital Circuits. *3(2-2-0). S. Preq: PY 208. Coreq: MA 341.* Fundamentals of analog and digital circuit analysis and design. Passive circuit components, node and mesh analysis, dynamic behavior, Laplace transforms, transistors and diodes, operational amplifiers, frequency response, analog filter design, combinational logic design, digital modules, flip-flops, sequential circuits and state machines, circuit simulation tools and technique. Laboratory exercises supplement the topics presented in class lectures.

BME 301 Human Physiology for Engineers I. *3(2-2-0). F. Preq: BME 202; MAT/BME 203; CH 221. BME majors only.* This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on cellular physiology, cell signaling mechanisms, membrane dynamics, homeostasis, blood, and the endocrine, nervous, and immune systems. Engineering applications, including biomaterials, biocompatibility, bioelectric phenomena, physiological modeling, and tissue engineering, also explored. Assignments include computer-based laboratory exercises and a team project. Students develop plans for a career in biomedical engineering.

BME 302 Human Physiology for Engineers II. *3(2-2-0). S. Preq: BME 301, BME 311, ST 370. BME majors only.* This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on systems physiology, including the nervous, muscular, cardiovascular, respiratory, and urinary systems. Engineering applications, including bioinstrumentation, biosignal processing, and compartmental analysis, are also explored. Assignments

include computer-based laboratory exercises using LavVIEW and team project.

BME 311 Linear Systems in Biomedical Engineering. *3(3-0-0). F. Preq: BME 201, BME 210. BME majors only.* 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.

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.* Students develop computer-based problem solving techniques 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.

BME 301 Human Physiology for Engineers. *3(2-2-0). F. Preq: BME 202; MAT/BME 203; CH 221. Coreq: BME 302. BME majors only.* This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on cellular physiology, cell signaling mechanisms, membrane dynamics, homeostasis, blood, and the endocrine, nervous, and immune systems. Engineering applications, including biomaterials, biocompatibility, bioelectric phenomena, physiological modeling, and tissue engineering are also explored. Assignments include computer-based laboratory exercises and a team project. Students develop plans for a career in biomedical engineering.

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 random biomedical signals and systems. Wiener filtering. Sampling theory. Discrete-time analysis. Applications of Z-transform and discrete Fourier transform. Digital filler design methods for biomedical instruments. Biomedical applications of filter design, signal restoration, and signal detection.

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, subthreshold stimuli, extracellular fields, membrane biophysics, and electrophysiology of the heart. Design and development of an electrocardiogram analysis system.

BME 432 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. Transducers necessary for experimental analysis and testing are introduced. Students learn advanced software packages to assist in their analyses.

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.

BIOMEDICAL ENGINEERING - Continued

BME 451 Biomedical Engineering Senior Design I. *3(2-2-0) F. Preq: BME 302, GC 120, ENG 331 or ENG333. Coreq: TE 466 or BME 425 or BME 441. BME majors only.* 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 property law, 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 only.* 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.

BOTANY

BO 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.

BO 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.

BO 200 Plant Life. *4(3-3-0). F,S,Sum. Credit cannot be given for both BO 200 and BO 250..* 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.

BO 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.

BO 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.

BO 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.

BO 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.

BO 250 Plant Biology. *4(3-3-0). F. Preq: BIO 181 and BIO 183 or BIO 125. Students may not receive credit for both BO 200 and BO 250.* An introduction for Life Science majors to the ecology, structure, function, processes, reproduction and evolution of higher plants.

BO 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.

BO 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.

BO 321 Introduction to Whole Plant Physiology. *4(3-0-2). 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.

BO 360 Introduction to Ecology. *3(3-0-0). S,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.

BO 365 Ecology Laboratory. *1(0-3-0). S,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.

BO 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.

BO 403 Systematic Botany. *4(2-4-0). Preq: BIO 125 or 105 or BO 200.* Systematic survey of vascular plants, emphasizing terminology, family characteristics, field identification, general evolutionary relationships, and mechanisms of plant speciation.

BO 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.

BO 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.

BO (ZO) 414 Cell Biology. *3(3-0-0). F. Preq: Preqs: CH 223, PY 212, ZO 160, or 250.* The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.

BO 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.

BO 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.

BOTANY - Continued

BO 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.

BO (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.

BO 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.

BO 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.

BO 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.

BUSINESS MANAGEMENT

BUS 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.

BUS 110 Microcomputer Applications for Management. *2(2-0-0). F,S,Sum. Credit for this course not allowed toward degrees in the College of Management.* 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.

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. Preq: Consent of Instructor.* 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 in business. 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 320 Financial Management. *3(3-0-0). F,S. Preq: EC 201 or ARE 201 and ACC 220 or 280; 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 (ST) 350 Economics and Business Statistics. *3(3-1-0) F,S,Sum. Preq: MA 114; EC 201 or ARE 201; 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 problems encountered in management and economics.

BUSINESS MANAGEMENT - Continued

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 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 personal computers 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 portfolio theory 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. Credit for both BUS 426 and EC 449 not allowed.* 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.

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 data communications.

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 design concepts, and data structures.

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 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.

BUSINESS MANAGEMENT - Continued

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 467 Electronic Marketing. *3(3-0-0). F,S. Preq: BUS 360.* Examination of the workings of the Internet and the likely convergence of electronic technologies. Emphasis on understanding different electronic business models and using electronic channels to implement research, promotion, transactions and distribution.

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, plansbook 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 of information 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 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 (TAM) 482 Textile Marketing Management. *3(2-2-0). F,S. Preq: TAM 382 or BUS 360, TAM 380.* The development and state of the art of current textile marketing management theory and practice are covered in classroom sessions. Management lab sessions include experiential, marketing games, and role-playing exercises. Current industry practice and government relations are stressed.

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. Preq: Consent of Instructor.* 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. Preq: Consent of department.* 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.

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. Credit will not be given for both CE 200 and CE 201.* 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.

CE 203 Global Positioning and Geographical Information Systems Applications. *1(1-0-0). F. Preq: GC 120. Coreq: ST 370. CE, CEM, ENE, or BE majors only.* 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. Not for CE department majors.* 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.

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. Coreq: ST 370. Open to Construction Engineering and Management majors only;Credit will not be given for both CE 261 and CE375.* Introduction to engineering economy, and principles and techniques of optimization for Construction Engineering and Management, including risk assessment.

CE 280 Principles of Environmental Engineering. *3(3-0-0). F. Preq: Matriculation into ENE, MA 241, 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 hazardous waste management.

CE 297 Current Topics in Civil Engineering. *1-4. F, S, Sum. Preq: Permission 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 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 313. Coreq: CE 215 and CE 325.* 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. *3(3-0-0). F,S,Sum. Preq: CSC 112 or 114; CE 313.* Analysis of internal forces and deformations in statically determinate trusses, beams and frames. Indeterminate structural analysis of trusses, beams and frames by force and displacement methods.

CE 327 Reinforced Concrete Design. *3(3-0-0). F,S,Sum. Preq: CE 325 and 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: MAT 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: C or better in CH 201 or BIO 125. 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 215, Junior standing in CE, CEC, CM, ENE, or BE. 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: C or better in CE 382. For students in CE, ENE, and CEM; others on space available basis.* 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 on quantity 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, 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 425 Introduction to Matrix Structural Analysis. *3(3-0-0) F. Preq: CE 325.* Review basic concepts related to displacement method of analysis; develop matrix equations for the solution for 2-D beam and frame structures by formulating elements of the structural stiffness matrix directly, and by assembling member stiffness matrices; approximate methods of analysis.

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 and matters 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 or equivalent.* 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.

CIVIL ENGINEERING - Continued

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 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. Credit for both CE 476 and CE 576 will not be given.* 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.

CE 477 Principles of Solid Waste Engineering. *3(3-0-0). S. Preq: CE 373, CE 375, CE 382.* Solid waste management including generation, storage, transportation, processing, land disposal and regulation. Processing alternatives including incineration and composting. Integration of policy 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 or equivalent; ST 380 (MEA Majors). Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.* 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.

CE 480 Water Resources Engineering Project. *3(1-4-0). S. Preq: CE 375 and 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 375, 383, CE 484. Coreq: Two of: CE 456, CE 476, CE 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 indeterminate pipe networks, and analysis of open channels with appurtenances.

CE 497 Current Topics in Civil Engineering. *1-4. F,S,Sum. Preq: Permission 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.

CE 498 Special Problems in Civil Engineering. *1-4. F,S. Preq: Sr. 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. Credit is not allowed for CH 100 if student has prior credit for CH 101.* 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.

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(0-3-0). F,S,Sum. Coreq: CH 101.* Laboratory experience to accompany CH 101. Introduction to basic laboratory equipment and skills. Emphasis on gravimetric and volumetric techniques.

CH 106 Computer Applications in Chemistry I. *1(0-3-0). F. Preq: CH major. Coreq: CH 101.* A supplement to CH 102 laboratory, for chemistry majors. An introduction to the use of computers in chemistry for data analysis, graphical data display, report preparation, and bibliographic searching.

CH 108 Computer Applications in Chemistry II. *1(0-3-0). S. Preq: CH 106, CH major. 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. 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.* 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.

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. Credit not allowed for both CH 211 and CH 315.* Methods of quantitative analysis based on solution chemistry, potentiometry, coulometry, chromatography, and molecular absorption and fluorescence spectroscopy. Statistics of measurement precision.

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. Credit is not allowed for both CH 220 and CH 221.* 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.

CH 221 Organic Chemistry I. *4(3-3-0). F,S,Sum. Preq: CH 101. Credit is not allowed for both CH 220 and CH 221.* 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.

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 295 Special Problems in Chemistry. *1-3. F,S,Sum. Preq: Consent of Department.* 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: H 201. Credit is not allowed for both CH 211 and CH 315.* Fundamental principles and modern techniques of chemical analyses: spectrochemical, electrochemical, volumetric and chromatographic methods of analysis, modern chemical instrumentation, and interpretation of data.

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 to accompany CH 401, for B.S. chemistry majors. Synthetic techniques including inert atmosphere, electrolysis, high-temperature, and ion-exchange illustrated by application to main-group and transition metal complexes and to other main-group compounds.

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. Credit may not be claimed for both CH 433 and CH 437.* An intensive study of physical chemical principles including molecular spectroscopy, statistical thermodynamics, reaction kinetics, kinetic theory, and transport properties.

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. Credit may not be claimed for both CH 433 and CH 437.* Selected physiochemical principles including quantum theory, spectroscopy, statistical thermodynamics, and rates of chemical reactions.

CHEMISTRY - Continued

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 201/202, MEA 200.* Chemical processes that control the composition of the oceans including discussions of chemical equilibria, biological cycling of nutrients, tracers of ocean circulation, minor and trace element distributions, and the chemical history of the marine environment.

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.* 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 computers and Fortran programming computer language for solving problems related to chemical engineering calculations.

CHE 225 Chemical Process Systems. *3(3-0-0). F,S,Sum. Preq: C or better in both CHE 205 and MA 242.* Introduction to methods of measurement of process variables and instrumental measurement methods. Dynamic process system behavior and computer simulation of steady state and dynamic processes. Introduction of equilibrium-stage process and graphical and analytical design methods.

CHE 311 Transport Processes I. *3(3-0-0). F,S. Preq: 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: 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: 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: 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. *3(1-4-0). F,S,Sum. Preq: CHE 311. Coreq: ENG 331.* 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 425 Process System Analysis and Control. *3(3-0-0). S. Preq: CHE 312. Credit cannot be received for both CHE 425 and CHE 525..* Dynamic analysis and continuous control of chemical 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. Credit cannot be received for both CHE 446 and CHE 546.* Characterization and measurement of the rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors.

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) 455 Polymer Technology and Engineering. *3(3-0-0). F. Preq: MAT 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). Preq: CHE 312 and CHE 446 or Consent of Instructor. Credit for both CHE 460 and CHE 760 is not allowed.* 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 nd process diagnostics.

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 465 Diffusion in Polymers. *3(3-0-0). S. Preq: CHE 461/543. Credit will not be given for both CHE 465 and CHE 565.* The theory of small molecule transport in polymers; application of membrane transport processes in the chemical, polymer, textile, coatings and natural fibers industries.

CHE 467 Polymer Rheology. *3(3-0-0). S. Preq: CHE 311 or equivalent.* Theoretical principles and experimental techniques associated with flow and deformation of polymer systems. Systems include: meffs 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. Credit will not be given for CHE 469 and CHE 769.* 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 and process improvement.

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 (NE) 485 Management of Hazardous Chemical and Radioactive Wastes. *1(1-0-0). F. Junior Standing. Credit will not be given for both NE 485 and 585.* Seminar series designed to provide an introduction to the management of both hazardous chemical and radioactive wastes. Topics include: hazardous waste treatment and disposal, pollution prevention, radioactive waste management, Superfund policy, state and federal regulations and risk assessment.

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.

COMPARATIVE LITERATURE

CL 495 Special Topics in Comparative Literature. *3(3-0-0)* Detailed investigation of a topic in comparative literature. Topic and mode of study determined by faculty member(s) in consultation with Comparative Literature Committee and heads of departments of English and Foreign Languages.

COLLEGE OF NATURAL RESOURCES

CNR 110 Forest Resources Scholars Forum. *0(2-0-0). F,S. Enrollment limited to participants in the 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 134 Computers in Natural Resources. *1(0-3-0). F,S. Freshmen and first semester transfer students only.* Forestry, wood science, recreation, and natural resource computer applications and exercises using word processing, spreadsheets, and database management programs. Introduction to microcomputer operating systems, specific application packages, and BASIC computer language.

CNR 210 Forest Resources Scholars Forum. *0(2-0-0). F,S. Enrollment limited to participants in the 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. Enrollment limited to participants in the 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 146 Business and Professional Communication. *3(3-0-0). F,S. Communication majors may not count COM 146 in the major.* The nature of communication theory and practice in business and professional settings. Development of individual, dyadic, group and organizational communication proficiencies. Supervisory/subordinate and peer communication, active listening, group communication, and presentational speaking.

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.* Process of influencing opinion through the use of logical arguments. Emphasis on analytical reasoning, evidence, and refutation. In-class argumentation.

COM 212 Interracial Communication. *3(3-0-0). F. Preq: Consent of Instructor.* Human communication in interracial contexts, with special emphasis on African-American and white American communication. Self awareness and self disclosure of racial attitudes and behaviors. Individual and group exercises and presentations.

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. Admission to Communication Major.* Micro- and macro-analytic theories used in the study of human communication: perspectives and assumptions

COMMUNICATION - Continued

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 234 Analysis of Entertainment Media. *3(3-0-0). F.* History and impact of media entertainment programming. Central focus on television but film, radio, print, and computer-based multimedia included. Evolution of contemporary entertainments and skills in criticism and analysis.

COM 240 Communication Inquiry. *3(3-0-0). F,S. Preq: COM 230. Admission to Communication Major.* 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 (AFS) 243 African-American Theater. *3(3-0-0). S.* African-American dramaturgy and its impact on the American theater; plays from the nineteenth century to the present.

COM 250 Communication and Technology. *3(3-0-0). F,S. Preq: COM 240. Admission to Communication Major.* 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 250. Coreq: COM 257.* 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 284 Introduction to Mass Communication. *3(3-0-0). F.* Development, structure, and functions of radio, television, film, books, newspapers, magazines and other mass media in the United States. Fundamentals of news, mass entertainment, advertising, public relations and mass communication research.

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 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 or COM 146.* 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 312 Patterns of Miscommunication. *3(3-0-0). F,S.* Miscommunication patterns originating from fallacious semantic assumptions held by communicators. Suggestions for preventing miscommunication.

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 or permission of instructor.* 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. Coreq: COM 257.* 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.

COMMUNICATION - Continued

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 334 Analysis of Information Media. *3(3-0-0). S. Preq: COM 234 or junior standing.* History and impact of informational and persuasive telemediated messages. Credibility and motivation in local and national news media, persuasion in political campaigns and social movements, art artifice in commercials, the infusion of entertainment elements into informational programs.

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 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.* 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 of electronic 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 atriculatory 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.* Roles of analysis and criticism of oral communication in political campaigns; analysis of special political communication situations; ghostwriting, news conferences, negative advertising.

COMMUNICATION -Continued

COM 435 Audiology. *3(3-0-0). S. LCD majors only.* 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 Digital Video Practicum. *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 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). Preq: COM 257. Coreq: COM 250, 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 employee motivation.

COM 457 Media and the Family. *3(3-0-0). F. Preq: COM 110, COM 250, 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 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 250. Coreq: 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. Instructor permission required.* Cold-reading scenes broken down to meet challenges of theatrical auditions. Personal technique developed to interpret texts 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: Jr. standing in Communication; permission of Department. Communication majors only.* 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.. Must be Junior or Senior majoring in Communication. Must have permission of department to enroll. May enroll only twice..* Special projects in communication developed under the direction of a faculty member on a tutorial basis.

CROP SCIENCE

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 211 Plant Genetics. *3(2-0-2). S. Preq: BIO 183 or ZO 160. Sophomore Standing.* 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 210 Residential Lawn Management. *3(3-0-0). F,S,Sum. Offered only as WWW course through the Office of Instructional Telecommunications. Students with credit for CS 200 may not take this course.* Introduction to turfgrass species and their uses. Emphasis on size and scope of the turfgrass industry, basic concepts of grass growth and development, technique for successful establishment and management of cool-and warm-season turfgrasses, fertilization, irrigation, aeration, pest management.

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 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 in crops 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 (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. Credit cannot be received for both CS 465 and CS 565.* 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.

CS (SSC) 490 Senior Seminar in Crop Science and Soil Science. *1(1-0-0). S. Preq: Senior 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.

COMPUTER SCIENCE

CSC 100 Computer Literacy. *2(2-0-0). Credit for CSC 100 is not allowed if student has prior credit in another computer science course or computer-related course. Offered only through Independent study by Extension.* Survey of computer hardware and software systems, how programs are created, how computers are used in organizations, and the effects of the computer society. Four written assignments and a final exam..

CSC 112 Introduction to Computing-FORTRAN. *3(2-3-0) F,S. Preq: E 115, MA 141.* Problem solving through writing FORTRAN programs. Particular elements include: careful development of FORTRAN programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstractions and verification; engineering applications.

CSC 114 Introduction to Computing-C++. *3(2-3-0). F,S,Sum. Preq: E 115 or PMS 100. Coreq: MA 121 or 131 or 141.* An introductory course in computing in C++. Emphasis on algorithm development and problem solving. Particular elements include: careful and methodical development of C++ programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; data abstraction and verification; numeric and nonnumeric applications; introduction to object-oriented programming and design.

CSC 116 Introduction to Computing - Java. *3(2-3-0). F,S. Preq: E 115. Coreq: MA 121 or 131 or 141.* An introductory course in computing in Java. Emphasis on algorithm development and problem solving. Careful and methodical development of Java applications and applets from specifications; documentation and style; appropriate use of control

structures; classes and methods; data types and data abstraction; object-oriented programming and design; graphical user interface design.

CSC 200 Introduction to Computers and Their Uses. *3(2-2-0). F,S,Sum. May not be used by CSC major as a restricted elective.* Survey of basic principles of computer hardware, communications, operating systems, microcomputer issues, security, impact on society, system development, and use in organizations. Hands-on use of software, including operating system commands, word processing, spreadsheets, and database managers. Demonstration and application of current end-user applications.

CSC 214 Programming Concepts. *3(3-0-0). F,S,Sum. Preq: CSC 114 with a grade of C- or better.* Software design in a high-level language: abstract data types, modular programming, management of large programs. Dynamic memory management: linked lists, pointers, allocation and deallocation. Alternate programming paradigms: recursive list processing, object-oriented programming.

CSC 216 Programming Concepts - Java. *3(3-0-0). F,S. Preq: C or better in CSC 112, 114 or 116. Coreq: CSC 224.* The second course in computing, intended for majors. Emphasis is placed on interpretation of inductive definitions (functions and data types); testing strategies; specification and implementation of finite-state machine; encapsulation; polymorphism; inheritance; class invariants; and resource management

CSC 224 Applied Discrete Mathematics. *3(3-0-0). F,S. Preq: CSC 114 and MA (121 or 131 or 141).* Formal logic. Methods of proof including induction. Introduction to grammars and finite state machines. Recurrence relations and asymptotic behavior of functions. Sets and counting. Boolean expressions and logic networks. Graphs and relations.

CSC 226 Discrete Mathematics for Computer Scientists. *3(3-0-0). F,S. Preq: CSC 116 and MA 141. CSC,CSU,CPE,CPU majors only.* Propositional logic and the predicate calculus. Logic gates and circuits. Methods of proof. Elementary set theory. Mathematical induction. Recursive definitions and algorithms. Solving recurrences. The analysis of algorithms and asymptotic growth of functions. Elementary combinatorics. Introduction to graph theory. Ordered sets, including posets and equivalence relations. Introduction to formal languages and automata.

CSC 234 Computer Organization and Assembly Language. *3(3-0-0). F,S,Sum. Preq: CSC 214 with a grade of C- or better.* Number systems, von Neuman machines, instruction sets and machine code, data representation, assemblers and assembly language programming, compilers, external and internal processor organization, memory, I/O organization and devices. Detailed study of a contemporary processor architecture.

CSC 236 Computer Organization and Assembly Language for Computer Scientists. *3(3-0-0). F,S. Preq: CSC 216 with grade of C- or better. CSC majors only.* Computer architecture topics required by professional software developers, including binary and hexadecimal numbers, hardware component organization, machine instruction sets, assembler language programming, linking assembler language with high-level languages, program testing, computer hardware design issues, computer software design issues, and trends in current computer design.

CSC 244 Concepts and Facilities of Operating Systems. *3(3-0-0). F,S. Preq: CSC 234.* The history and evolution of operating systems, concepts of process management, memory addressing and allocation, files and protection, deadlocks and distributed systems.

CSC 246 Concepts and Facilities of Operating Systems for Computer Scientists. *3(3-0-0). F,S. Preq: CSC 236. CSC,CPE majors only.* Fundamental concepts of computer operating systems for computer scientists, including memory management, file systems, process management, distributed systems, deadlocks, and basic security and system accounting.

CSC 251 Web Page Development. *1(1-0-0). S. Preq: E 115 or equivalent knowledge of EOS/Unity system.* Syntax and semantics of HTML (HyperText Markup Language). Students will learn necessary skills to develop web pages on their EOS/Unity account. In addition to mechanics, design aspects and bandwidth conservancy are covered. Several pages will be created including a final project.

CSC 253 C and C++ for Java Programmers. *1(1-0-0). F,S. Preq: CSC 116.* Programming in the C and C++ languages. Concentrates on aspects of the language that differ from the Java language, with the assumption that students already have a basic knowledge of programming, so builds upon an understanding of loops, conditional logic, and a basic understanding of objects.

CSC 254 Visual C ++. *1(1-0-0). F. Preq: CSC 214.* Programming in Windows 95/NT using the Visual C++ compiler and tools. The focus is on using the Microsoft Foundation Classes (MFC), understanding the Win32 API, and modern operating systems concepts.

CSC 255 String Processing Languages. *1(1-0-0). Preq: CSC 112 or CSC 114 or CSC 200.* Syntax and semantics of a string manipulation language, currently SNOBOL 4. Application of the language to programming problems in non-numeric areas. Discussion of other string processing languages such as PERL.

CSC 257 Introduction to Java. *1(1-0-0). F. Preq: CSC 214.* Introduction to the Java programming language. Object-oriented techniques and language syntax. Java class libraries including strings, graphical interfaces, events, exceptions, arguments, threads, file i/o, and networking.

CSC 258 Programming Language-C. *2(2-0-0). Preq: CSC 244.* Systems implementation language C. History and current applications; syntax and semantics of C; paradigms of C that set it apart from other high-level languages; C programming environment.

CSC 295 Special Topics in Computer Science. *1-3.* Special topics in CSC at the early undergraduate level.

CSC 302 Introduction to Numerical Methods. *3(3-0-0). F,S. Preq: CSC 112 or CSC 114 and MA 305. CSC major or 2.7 GPA.* Numerical computations with digital computers; floating point arithmetic and implications of round-off error. Algorithms and computer techniques for the numerical solution of problems in: function evaluation; zeros of functions; interpolation; numerical differentiation and integration; linear systems of equations; curve fitting; solutions of non-linear equations; numerical solutions of ordinary differential equations.

CSC 312 Computer Organization and Logic. *4(3-3-0). F,S. Preq: CSC 224, CSC 234..* Combinational logic circuits and their relation to Boolean algebra. Functional properties of combinational and sequential components and their realizations in integrated circuit forms. Organization of digital computer components; processors, control units, memories, switches, and peripherals. Architecture of computer systems. Computer arithmetic. Microprogrammed control. Interrupt mechanisms. Laboratory exercises involve logical, functional, and electrical properties of components from gates to microprocessors.

CSC 314 Data Structures. *3(3-0-0). F,S,Sum. Preq: CSC 214 and CSC 224 with a grade of C- or better.* A survey of fundamental abstract data types along with efficient implementations for each. Emphasizes asymptotic running time as a measure of program performance. Lists, stacks, queues, sparse arrays, binary trees, heaps, balanced search trees, and hash tables. Illustrative applications such as graph, text-processing, or geometric algorithms.

CSC 316 Data Structures for Computer Scientists. *3(3-0-0). F,S. Preq: CSC 216 and CSC 226 with a grade of C- or better. CSC,CPE majors only.* Abstract data types; abstract and implementation-level views of data types. Linear and branching data structures, including stacks, queues, trees, heaps, hash tables, graphs, and others at discretion of instructor. Best, worst, and average case asymptotic time and space complexity as a means of formal analysis of iterative and recursive algorithms.

COMPUTER SCIENCE - Continued

CSC 326 Software Engineering. *3(2-2-0). F,S. Preq: CSC 314 or 316.* Application of product engineering methods to software: quality assurance, project management, requirements analysis, specifications, design, development, testing, production and maintenance.

CSC 333 Automata, Grammars, and Computability. *3(3-0-0). F,S. Preq: CSC 224. CSC major or 2.7 GPA.* Study of three classical formal models of computation--finite state machines, context-free grammars, and Turing machines--and the corresponding families of formal languages. Power and limitations of each model. Parsing. Non-determinism. The Halting Problem and undecidability. The classes P and NP, and NP-completeness.

CSC (BUS) 340 Information System Management. *3(3-0-0) F,S. Preq: M 200 or equivalent.* Fundamentals of information systems development and use in organizational setting. Information systems (IS), concepts, hardware, software, telecommunications, database management. IS development, applications and management in telecommunications, database management, various business processes, global issues, security and ethical challenges.

CSC 379 Ethics in Computing. *1(1-0-0). S. Preq: Junior standing. CSC major or 2.7 minimum GPA.* Discussion of the concern for the way in which computers pose new ethical questions or pose new versions of standard moral problems and dilemmas. Study of ethical concepts to guide the computer professional. Computer professional codes of ethics. Use of case studies to relate to ethical theory. Ethical and legal use of software. Conflicts of interest.

CSC 401 Data and Computer Communications Networks. *3(3-0-0). F. Preq: MA 314 or ST 371, CSC 244. Credits are not allowed for both CSC 401 and ECE 460.* Basic concepts of data communication networking and computer communications architectures, including packet switching, local area networks, OSI (Open System Interconnection Architectures), TCP|IP, X.25|X.75, and SNA (System Network Architecture).

CSC 402 Network Projects. *3(3-0-0). Preq: CSC 401, CSC 312. No auditing.* Under the supervision of faculty members, students engage in projects that may include communication architecture implementation, networking technology assessment, network performance evaluation, and network administration. Comprehensive written and oral project report required.

CSC 405 Introduction to Computer Security. *3(3-0-0). S. Preq: CSC 246.* Basic concepts in information security and management such as risks and vulnerabilities, encryption practices, program security, operating system security, trusted operating system design, database security, distributed system security, security administration, and legal issues. Coverage of high-level concepts such as confidentiality, integrity, and availability applied to hardware, software, and data. Case studies of actual program threats and secure operating systems followed up with secure programming practices. Textbook augmented by readings and class discussions of current events.

CSC 411 Introduction to Artificial Intelligence. *3(3-0-0). S. Preq: CSC 224 or LOG 201.* Overview and definitions of Artificial Intelligence (AI). Search, including depth-first and breadth-first techniques with backtracking. Knowledge representation with emphasis on logical methods, Horn databases, resolution, quantification, unification, skolemization and control issues; non-monotonic reasoning; frames; semantic nets. AI systems, including planning, learning, natural language and expert systems. An AI programming language may be taught at the instructor's discretion.

CSC 413 Electronic Commerce Technology. *3(3-0-0). S. Preq: CSC 314 or 316.* An introduction to the technologies underlying electronic commerce. Topics include Web protocols and languages, Web mining,

product ontologies, security anonymity, privacy, recommendation systems, personalization, auctions, trading agents, and intellectual property.

CSC (MA) 416 Introduction to Combinatorics. *3(3-0-0). S, Alt.yrs. Preq: MA 242 or CSC (MA) 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.

CSC 417 Theory of Programming Languages. *3(3-0-0). F,S. Preq: CSC 314.* Theory of programming languages with emphasis on programming language semantics and implementation issues. Formal models of syntax and semantics. Static versus dynamic scoping. Parameter passing mechanisms. Garbage collection. Programming in alternate paradigms such as applicative, functional, logic, and object-oriented programming languages.

CSC 423 Information Resources Management. *3(3-0-0). Preq: CSC/BUS 340. May not be used as a CSC restricted elective.* Information Resources Management as a process that encompasses strategic planning, the implementation of new technology, dramatic changes to both the corporate Management Information Services and traditional information systems architecture, and the emerging role of end user computing to enable a business enterprise to operate effectively.

CSC (MA) 427 Introduction to Numerical Analysis I. *3(3-0-0). Preq: MA 301 and programming language proficiency. May not be used as a CSC restricted elective.* 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.

CSC (MA) 428 Introduction to Numerical Analysis II. *3(3-0-0). F,S. Preq: MA 405 and programming language proficiency; MA (CSC) 427 is not a prerequisite. May not be used as a CSC restricted elective.* 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.

CSC 431 File Organization and Processing. *3(3-0-0). F,S. Preq: CSC 314.* Hardware characteristics of storage devices. Basic file organizations including sequential, direct, and indexed sequential; hashing and collision resolution; perfect hashing; signatures; bloom filters; sorting and other bit level structures. Tree structures including binary search trees, B-trees, and tries. Dynamic hashing techniques. Structures including grid files. Applying file structures to practical problems.

CSC 440 Database Management Systems. *3(3-0-0). F. Preq: CSC 316. CSC Majors only.* Introduction to database concepts. This course examines the logical organization of databases: the entity-relationship model; the relational data model and its languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity, concurrency control, transaction processing, and distributed database systems.

CSC (IE) 441 Introduction to Simulation. *3(3-0-0). F,S. Preq: MA 242, ST 372, programming proficiency.* 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.

CSC 451 Operating Systems. *3(3-0-0). F,S. Preq: CSC 244, CSC 314.* Design and implementation of operating system internals. Structure of an operating system kernel, process synchronization primitives, interrupt handlers, and device drivers. Details of the run-time environment supporting high level languages for concurrent programming. Programming required.

CSC 454 Human-Computer Interaction. *3(3-0-0). S. Preq: CSC 314.* A survey of concepts and techniques for user interface design and human computer interaction. Emphasizes user-centered design, interface development techniques, and usability evaluation.

CSC 456 Computer Architecture and Multiprocessors. *3(3-0-0). S. Preq: CSC 234 and CSC 314.* Major components of digital computers and the organization of these components into systems. Begins with single processor systems and extends to parallel systems for multiprocessing. Topics include computer organization, instruction set design, cache memory, pipelined processors, and multiprocessors. Recent developments in PC and desktop architectures are also studied.

CSC (ECE) 460 Digital Systems Interfacing. *3(2-3-0). F,S. Preq: A grade of C or better in either ECE 206 or CSC 312.* 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.

CSC 461 Computer Graphics. *3(3-0-0). F. Preq: MA 305 and CSC 314 and knowledge of C or C++.* Principles of computer graphics with emphasis on two-dimensional and aspects of three-dimensional raster graphics. Topics include: graphics hardware devices, lines and polygons, clipping lines and polygons to windows, graphical user interface, vectors, projections, transformations, polygon fill. Programming projects in C or C++.

CSC 462 Advanced Computer Graphics Projects. *3(3-0-0) S. Preq: CSC 461. CSC majors only.* Principles of computer graphics with emphasis on three-dimensional graphics. Topics include: 3-D projections and transformations, curves and surfaces, color and texture, animation, visualization, and global illumination techniques. Programming project required.

CSC 467 Multimedia Technology. *3(3-0-0). S. Preq: CSC 244. Coreq: CSC 312.* Methods of creating, recording, compressing, parsing, editing and playing back on a computer the following media: sound, music, voice, graphics, images, video, and motion. Introduction to basic principles: signal processing, information theory, real-time scheduling. Also includes discussion of standards, programming tools and languages, storage and I/O devices, networking support, legal issues, user interfaces, and applications. Includes significant hands-on experience.

CSC 471 Software Process and Development Tools. *3(3-0-0) F. Preq: CSC 244, CSC 314.* A study of project software management, development and computer-based software engineering tools. Topics include: team-work, software standards and processes, personal software process, computer-based software engineering (CASE) tools (e.g., CASE tools for classical and object-oriented software specification, analysis, design, verification, validation, testing, and maintenance.)

CSC 481 Computer game Design and Development. *3(3-0-0) S. Preq: CSC 316. CSC majors only.* An introduction to the technologies and practices underlying computer and console game development and the principles involved in effective game design and production. Topics include computer game graphics, sound and audio, level design, principles of game play, interactive storytelling, character control and artificial intelligence, user interface design. Programming project required.

CSC 489 Fundamentals of Computer Science. *3(3-0-0). F. Preq: Higher level computer language. Not available to majors in Computer Science.* Provides the background for graduate students who do not have an undergraduate degree in computer science to take selective, graduate-level computer science courses. Computer organization from both hardware and

software viewpoints is discussed. Includes computer system organization, digital logic, microprogramming, conventional machine language, operating systems, assembly language, advanced computer architectures, and data structures.

CSC 492 Senior Design Project. *3(2-2-0). F,S. Preq: CSC 326. CSC majors only.* Application of software engineering principles and basic computer science to the total development of a software system. Consideration of the software system design process, including requirements and design detail. Development and evaluation of a prototype accomplished through design team activity. Comprehensive written and oral project report is required.

CSC 495 Special Topics in Computer Science. *1-6. F,S,Sum. Preq: Consent of Instructor.* Used for the following types of study: readings in the literature of computer science, introductory research projects, major computer programming projects, seminars, or new course development. Work may be done in any CSC area such as software, hardware utilization, programming languages, numerical methods or telecommunications.

CSC 499 Independent Research in Computer Science. *1-6. F,S,Sum. Preq: Consent of Department.* Independent investigation of a research problem under faculty supervision.

DESIGN

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. *1-3. F,S,Sum.* Topics of current interest in the College of Design. Used to develop new courses.

PHYSICAL EDUCATION - 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 (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.

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. *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. College of Design students only.* 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.

ENGINEERING

E 101 Introduction to Engineering & Problem Solving. *1(0-2-0). F. Engineering majors; CLAS FR;SCH 14.* 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: Enrollment limited to participants 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: Enrollment limited to participants 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.* Fundamentals of the EOS System. Software and services available on the system. Network hardware configuration, on-line help and communication, file and directory manipulation. Software applications such as E-mail, publishing packages, spreadsheets, mathematical packages, CAD packages.

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: Enrollment limited to participants 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: Enrollment limited to participants 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.

ENGINEERING - Continued

E 432 Patents, Trademarks and Copyrights. *3(3-0-0). S. Preq: Jr. 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. Engineering Seniors and PBS students only. Credit may not be counted toward graduation.* 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.

E 497 Engineering Research Projects. *1-3. F,S,Sum. Preq: Jr. Standing in College of Engineering; Restricted to participants in Engineering Scholars Program and Engineering Research Center Scholars.* Projects in research, design or development in engineering or computer science.

ECONOMICS

EC 201 Principles of Microeconomics. *3(3-0-0). F,S,Sum. Credit will not be given for both EC 201 and either ARE 201 or EC 205.* 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.

EC 202 Principles of Macroeconomics. *3(3-0-0). F,S,Sum. Preq: EC 201 or ARE 201. Credit will not be given for both EC 202 and EC 205.* 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.

EC 205 Fundamentals of Economics. *3(3-0-0). F,S,Sum. 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.* 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.

EC (ARE) 301 Intermediate Microeconomics. *3(3-0-0). F,S,Sum. Preq: MA 121 or 131; EC 201 or EC 205 or ARE 201. Credit not allowed for both EC(ARE) 301 and 401.* 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.

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.

ECONOMICS - Continued

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. Credit will not be given for both EC 304 and EC 404.* 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.

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: 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.

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 (ARE) 401 Economic Analysis for Nonmajors. *3(3-0-0). F,S. Preq: EC 201 or EC 205 or ARE 201. 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.* 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.)

EC 404 Money, Financial Markets, and the Economy. *3(3-0-0). F,S. Preq: EC 302, BUS/ST 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.

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.

ECONOMICS - Continued

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 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: Consent of the Department.* 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: Consent of Department.* 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. Open to University Transition Program (UTP) students only.* 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. Open to University Transition Program (UTP) students only.* 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. Priority will be given to resident advisors and students active in student organizations or volunteer programs.* 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.

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. Consent of Department.* 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 and an out-of-class team building experience 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 & COMPUTER ENGINEERING

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. Coreq: PY 208, MA 242. Restricted to students who are enrolled in EE or CPE curricula.* 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(3-1-0) 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 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: Grade of C- or better in 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 logic synthesis, 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- or better 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: ECE 200,ECE 206, ECE 212. CPE majors only.* Introduction to designing microcontroller-based embedded computer systems using assembly and C programs to control input/output peripherals. Use of embedded operating system.

ECE 331 Principles of Electrical Engineering I. *3(3-0-0). F,S,Sum. Preq: MA 241, PY 208. Not available to EE and CPE majors.* 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.

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 propogation, 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-domain analyses. Design and implementation of digital controllers.

ECE 437 Distributed Real Time Control Systems. *3(2-4-0). F,S. Preq: ECE 212, ECE 301.* 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.

ELECTRICAL & COMPUTER ENGINEERING - Continued

ECE (CSC) 460 Digital Systems Interfacing. *3(2-3-0). F. Preq: ECE 406.* 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: ECE 406.* 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 206 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. *4(3-3-0). F,S. Preq: ECE 212,301,302,303; COM 110; ENG 331 and any 2 ECE intermediate electives.* 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. *4(3-3-0). F,S. Preq: ECE 301,302,303,406; CSC 316; COM 110; ENG 331 and any 1 additional ECE intermediate elective.* Application of engineering and basic sciences to the total design of hardware and software 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. Preq: Consent of instructor.* Offered as needed for development of new courses in electrical and computer engineering.

CURRICULUM & INSTRUCTION

ECI 102 Orientation to Middle Grades Education. *0(1-0-0) F,S. Restricted to 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 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 a variety of education settings including an extended period in one curriculum area.

ECI 210 Introduction to College Tutoring. *1(1-0-0). F,S. GPA 2.8 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. Registration is restricted to university tutors.* 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.

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 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 ED and/or PSY.* 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 ED/PSY.* 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.

CURRICULUM & INSTRUCTION - Continued

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) Preq: For certification majors: EOE 101, 205. For non-certification majors: EOE 101. For credentialed health professionals only.* 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 only.* 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 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 and/or 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 and/or 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. Taught M-F during first 7 weeks of the semester.* Methods and materials for teaching modern foreign languages K-12 including the use of instructional media.

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,ECI 309, ECI 306, ECI 307, Senior Standing. Coreq: ECI 435. Admission to candidacy in Middle Grades Teacher Education; senior standing..* 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 current medical 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 Marketing Education. *3(3-0-0). F. Preq: Admission to Teacher Education Candidacy, EOE 207.* The theory and skills necessary to plan, administer, operate, and evaluate effective programs in marketing education.

ECI 446 Curriculum and Methods of Teaching Marketing Education. *3(3-0-0). F. Preq: Admission to Teacher Education Candidacy.* Curriculum common to marketing education and research behind its development. Methods common to instructional planning, implementation, and evaluation of effective marketing education programs.

ECI 447 Student Teaching in Marketing Education. *8(2-15-0). S. Preq: Admission to Professional Semester. Coreq: ECI 494.* Skills and techniques required by prospective teachers in the marketing education

CURRICULUM & INSTRUCTION - Continued

classroom. Fifteen weeks student teaching full-time in a public school: observation, instruction, evaluation, advisement, and administration.

ECI 450 Methods and Materials in Teaching English. *4(3-2-0). F. Preq: ECI 205, ELP 344, PSY 304; senior standing and admission to Teacher Education candidacy with a major in English. Taught during the first seven weeks of the semester.* 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.

ECI 451 Improving Reading in Secondary Schools. *2(2-0-0) F,S,Sum. Preq: 6 hours of ED and/or PSY.* 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 454 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. Taught during the first six weeks of the semester.* 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.

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 the total school program, and participates in a variety of school and community activities.

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. 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 Marketing Education. *3(3-0-0). S.* Analysis and discussion by marketing education majors of problems and successes experienced while student teaching in the public schools.

ECI 496 Special Topics in Education. *1-3. F,S,Sum. 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.

EDUCATION

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: Enrollment limited to participants in the 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 (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: Enrollment is limited to 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) 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 (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(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.

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 or Consent of Instructor.* 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) 426 Methods of Teaching Agriculture. *3(3-0-0) F. Preq: JR. standing or Consent of Instructor.* 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.

EDUCATION - Continued

ED (AEE) 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 (AEE) 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 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.* 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.

EDUCATIONAL LEADERSHIP & PROGRAM EVALUATION

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: Jr. 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 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.

MATHEMATICS, SCIENCE, & TECHNOLOGY EDUCATION

EMS 101 Orientation to Mathematics and Science Education. *0(1-0-0). F,S. Open only to students in Math and Science Education.* 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.

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 470 Methods and Materials for Teaching Mathematics. *3(3-0-0). F. Preq: Admission to the professional semester. Taught during the first*

seven weeks of the semester. Purposes, methods, curricula and evaluation practices for teaching mathematics in middle school and high school.

EMS 471 Student Teaching in Mathematics. *3-8. F. Preq: Admission 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. Taught during the first 7 weeks of the semester.* 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.

EMS 474 Teaching Mathematics Topics in the Middle Grades. *3(3-0-0). F. Preq: Admission to professional semester. Coreq: EMS 470. Taught during the first 7 weeks of the semester.* 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.

EMS 475 Methods of Teaching Science. *3(3-0-0). F. Preq: EMS 203, ELP 344, ED 310, PSY 304. Coreq: EMS 476. Taught during the first seven weeks of the semester.* Goals, methods, curricula, and evaluation practices in teaching the physical and biological sciences at the middle and secondary school levels.

EMS 476 Student Teaching in Science. *4-8. F. Preq: EMS 203, ELP 344, ED 310, PSY 304. Coreq: EMS 475. Students must have senior standing and be admitted to the professional semester.* Supervised classroom experience in developing the skills and techniques for teaching science in a selected middle or secondary school for 10 weeks.

EMS 477 Instructional Materials in Science. *3(2-2-0). F. Preq: EMS 203, ELP 344, PSY 304. Coreq: EMS 475. Part of professional semester; 2 lecture hours and 6 lab hours per week for 7 weeks.* 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.

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 and consent of department.* 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.

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.

ENG 110 Developmental English. [Course phased out effective 8-03] *3(3-0-0). F,S,Sum. Credit is not applicable toward graduation in any curriculum. Students placed in ENG 110 must receive a grade of S in order to advance to ENG 111.* Development of basic writing skills through supervised writing, analyzed readings, and self-paced drills. Parts of speech; principles of spelling, capitalization, and punctuation; vocabulary study; composition of sentences, simple paragraphs, and short essays. Role of invention and revision in the writing process.

ENG (FLE) 111 Composition and Rhetoric. [Course phased out effective 8-03] *3(3-0-0). F,S,Sum. Students must take the freshman composition courses in succession until they complete both requirements. They must receive at least a C- in 111 in order to advance to 112.* Introduction to elements and strategies of argumentative writing for civic and academic audiences. Strategies for generating, organizing, and revising texts. Includes instruction in library research methods, use of evidence, and essay exams. Attention to grammar and conventions of standard written English.

ENG (FLE) 112 Composition and Reading. [Course phased out effective 8-03] *3(3-0-0). F,S,Sum. Preq: C- or better in ENG 111.* Continued study of elements and strategies of argumentative writing for academic audiences, with attention to the connections between critical reading and writing. Analysis of arguments from different disciplines. Interpretation, analysis, and evaluation of a substantial number of literary works. Continued instruction in research and use of evidence, and attention to grammar and conventions of standard written English.

ENG 113 Composition, Rhetoric, and Reading. [Course phased out effective 8-03] *3(3-0-0). F,S,Sum. Preq: Placement scores determined by the English Department.* Accelerated composition course for students with high SAT-Verbal or AP scores. Elements and strategies of argument; critical reading of and writing about civic arguments, academic arguments from two or more fields, and a substantial number of literary works; library research; grammatical and stylistic conventions of standard written English. Six credit hours for completion with a 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. Does not satisfy requirements for English major.* 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.

ENG 210 Introduction to Language and Linguistics. *3(3-0-0). F,S. Preq: ENG 112.* 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 112.* 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 production 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.* 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 111 or ENG 113.* 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. Preq: ENG 111 and ENG 112; or ENG 113. Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222.* 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, Danta, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf.

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 (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.

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.

ENGLISH - Continued

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. Credit will not be given for both ENG 251 and either ENG 261 or 262.* 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.

ENG 252 Major American Writers. *3(3-0-0). F,S,Sum. Credit will not be given for both ENG 252 and either ENG 265 or 266.* 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.

ENG 260 Introduction to Literary Study. *3(3-0-0). F,S,Sum. Preq: ENG 112.* 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 English major. 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, BrontÙ, 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 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 112 or ENG 113.* 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.* 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.* 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 (WGS) 305 Women and Literature. *3(3-0-0). S.* 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 (COM) 321 Survey of Rhetorical Theory. *3(3-0-0). F. Preq: COM 201 or permission of instructor.* 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 112.* 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 111, ENG 112, ENG 210.* Study of Modern English at the sentence level. Analysis of grammatical structure. Consideration of language variation in English.

ENG 325 Spoken and Written Traditions of American English Dialects. *3(3-0-0). S. Preq: ENG 111 and 112 or ENG 113.* 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 112.* 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 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).

ENGLISH - Continued

ENG 328 Language and Writing. *3(3-0-0). S. Preq: ENG 112.* 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. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.* 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.

ENG 332 Communication for Business and Management. *3(3-0-0). F,S,Sum. Preq: Junior standing. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.* 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.

ENG 333 Communication for Science and Research. *3(3-0-0) F,S. Preq: Junior standing. Credit is not allowed for more than one of ENG 331, 332, and 333.* 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.

ENG (AFS) 349 African Literature in English. *3(3-0-0). S.* 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: ENG 215, ENG 314.* 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.* 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.* 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: ENG 111, ENG 112.* 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.* 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: ENG 111and ENG 112; or ENG 112H.* 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.* 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.* 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.* 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. Preq: ENG 111Z or 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.

ENG 376 Science Fiction. *3(3-0-0). F,S. Preq: ENG 111, ENG 112.* 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.* 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.* 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 Special Topics in Modern Drama. *3(3-0-0). F. Preq: ENG 111 and ENG 112; or ENG 113.* Various topics in modern dram 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 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.* 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.

ENGLISH - Continued

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.* Influences of the Bible-principal forms, genres, and texts-on major English and American writers such as Milton, Spenser, Melville, Eliot, and Faulkner.

ENG 390 Classical Backgrounds of English Literature. *3(3-0-0). S.* 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 (FL) 392 Major World Author. *3(3-0-0). F,S. Preq: ENG 111 and 112; or ENG 113.* 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: ENG 111 and 112; or ENG 113. Course may be taken 3 times in different genres..* 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.

ENG (FL) 394 Studies in World Literature. *3(3-0-0). F,S.* 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.* 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.* 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: Majors in LTN; 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 or above.* 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(3-0-0). F. Preq: ENG 111 and ENG 112; or ENG 113.* 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: ENG 111 and ENG 112; or ENG 113.* 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 (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.* 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 112; Jr. standing.* 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 260.* 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.* 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.* 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.* Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales.

ENGLISH - Continued

ENG 452 Medieval British Literature. *3(3-0-0). S.* 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. Prior knowledge of Middle English unnecessary.

ENG 453 The Romantic Period. *3(3-0-0). F.* 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 460 Major British Author. *3(3-0-0). S.* In-depth study of the works of one (or two) British author(s) within their historical and literary-historical context. Sample authors might include; Spencer 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.* 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.* 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.* 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.* 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: A grade of C- or better in ENG 112 (or equivalent).* 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.* 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.* 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.* 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.* 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.* 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.

ENGLISH - Continued

ENG 486 Shakespeare, The Earlier Plays. *3(3-0-0). F. Preq: ENG 112.* 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: ENG 112.* Shakespeare's major works after 1600 with emphasis on his tragedies and the late romances.

ENG 488 Advanced Fiction Writing. *3(3-0-0). F,S. Preq: A grade of B or better in ENG 288 or 289, or demonstrated competence in creative writing.* Workshop in creative writing for the student with demonstrated understanding of the basic techniques of writing prose fiction.

ENG 489 Advanced Poetry Writing. *3(3-0-0). S. Preq: A grade of B or better in ENG 288 or 289, or demonstrated competence in creative writing.* Workshop in creative writing for the student with demonstrated understanding of the basic techniques of writing poetry.

ENG 490 Studies in Medieval Literature. *3(3-0-0). F. Preq: ENG 111 and 112 or 113; ENG 261.* 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 cultural and historical backgrounds and contemporary scholarship. Some texts in Middle English, some in translation; no prior knowledge of Middle English needed.

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 112; 6 credit hours linguistics.* (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. Junior 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.

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 and social system of one of the animal world's most complex and highly organized non-human societies.

ENT 401 Advanced Beekeeping. *3(2-3-0). S. Preq: ENT 203. Credit not allowed for both ENT 401 and ENT 501.* 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.

ENT (FOR) 402 Forest Entomology. *3(2-2-0). S. Preq: Junior Class 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 207 Introduction to Teaching Occupational Education. *3(2-3-0). F, S.* Introduction to teaching vocational education programs in middle and secondary schools. Field experiences and course assignments including three hours each week assisting classroom teachers in the public schools.

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.

OCCUPATIONAL EDUCATION - Continued

EOE 307 Field Work in Occupational Education. *2-6. F,S,Sum. Preq: Sophomore standing and consent of instructor. May be repeated for a maximum of 6 credits.* 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.

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. Open only to 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.

EOE 495 Senior Seminar in Technology Education. *1-3. F,S. Preq: Junior standing in ED and consent of the department.* An in-depth investigation of a topic or a set of problems and/or issues in Technology Education.

EOE 498 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.

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, energy and 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.

ENVIRONMENTAL TECHNOLOGY - Continued

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.* Major types of environmental emergencies and expected responses. Regulatory requirements associated with environmental emergencies. Visits to local emergency response facilities to observe real-world responses to environmental emergencies. Hazardous Materials Transportation Act Certification Examination preparation and exam. Required field trips may extend beyond class 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 310 Environmental Monitoring and Analysis. *3(3-0-0) S. Preq: ET 100,MA 121,CH 202,CH 220,CH 315,PY 131,SSC 220.* 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 anthropoganic 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 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. *4(3-3-0). S. Preq: ET 320, ET 330, ST 311 or ST 301.* 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 490 Senior Seminar in Environmental Technology. *1(1-0-0). S. Preq: Senior stand.* 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 & 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. Special emphasis 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 principle 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. Preq: ENG 111 and ENG 112; or ENG 113. Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222.* 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, Danta, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf.

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 (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, 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: Consent of department.* 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,Sum. Preq: Consent of department.* 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. Preq: ENG 111 and 112; or ENG 113.* 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. Preq: ENG 111 and 112; or ENG 113. Course may be taken 3 times in different genres..* 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.

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). Preq: ENG 111 and ENG 112; or ENG 113.* 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). Preq: ENG. 111 and ENG. 112; or ENG. 113.* 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: Consent of department.* 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. Junior 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,Sum. Preq: Consent of department.* 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.

FOREIGN LANGUAGES & LITERATURES - 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.

FOREIGN LANGUAGES & LITERATURES- ENGLISH

FLE 100 Introduction to Academic Writing. *4(4-0-0). F,S. 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.* 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.

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 (ENG) 111 Composition and Rhetoric. *3(3-0-0). F,S. Only for non-native speakers of English. Successful completion of FLE 111 required a grade of C or better.* For non-native speakers of English

FLE (ENG) 112 Composition and Reading. *3(3-0-0). F,S. Preq: A grade of C or better in FLE 111 or ENG 111. Only for non-native speakers of English. Successful completion of FLE 112 requires a grade of C or better.* For non-native speakers of English.

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 in the 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.

FOREIGN LANGUAGES & LITERATURES - 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 201 Intermediate French I. *3(3-0-0). F,S,Sum. Preq: FLF 102.* 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 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, 311, 315) or FLF 202.* 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, 311, 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 306 French Business Communication. *3(3-0-0). Alt. yrs.(even). Preq: FLF 202 or by instructor's permission.* 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 or permission of instructor.* 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 or FLS 105.* 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 311 Methods and Techniques in French Translation. *3(3-0-0). F, Alt. yrs.(odd). Preq: FLF 202.* Translation from French to English and English to French. Emphasis on differences and similarities between the two languages. Development of practical translation skills, using current materials on science, technology, medicine, cinema, arts, literature, culture, politics, law, business, and other topics of interest to the students.

FOREIGN LANGUAGES & LITERATURES- FRENCH - Continued

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 or permission of instructor.* 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 323 The French Novel of the Twentieth Century. *3(3-0-0). F. Preq: 3 hrs. in French at 300 level with 3 hrs. in literature.* Reading and discussion of novels by representative authors of the period such as Gide, Proust, Colette, Malraux, Camus, Robbe-Grillet, Duras, Sarraute.

FLF 352 Literature, Cinema and Culture of the Francophone World. *3(3-0-0). S, Alt yrs(odd). Preq: 6 hours in French above 200 level (3 hours must be in Literature) or permission of the instructor.* Literary, cinematic and cultural productions of the Francophone World: North and West Africa, the Caribbean and Quebec. Taught in French.

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 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 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.

FOREIGN LANGUAGES & LITERATURES-GERMAN - Continued

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.

FOREIGN LANGUAGES & LITERATURES-GERMAN - Continued

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 advanced reading 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 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 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.

FOREIGN LANGUAGES & LITERATURES- 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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-JAPANESE - Continued

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. May be repeated for a maximum of three credit hours.* 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.

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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-HINDI-URDU

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

FOREIGN LANGUAGES & LITERATURES-HINDI-URDU - Continued

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 a 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 and movies.

FLN 208 Intermediate Hindi Conversation. *3(3-0-0). F. Preq: FLN 201 or permission of instructor.* 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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-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.

FOREIGN LANGUAGES & LITERATURES-SPANISH - Continued

FLS 110 Accelerated Elementary Spanish. *3(3-0-0). F,S,Sum. 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. 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 for Engineers: Language, Culture, Technology. *3(3-0-0). S. Preq: Two years of high school Spanish or FLS 101 and FLS 102. College of Engineering students only.* A study of the structures necessary for an intermediate level of communication in Spanish, integrating vocabulary, issues, and projects in addition to cultural and technical issues of our global society that are of special interest to the engineering student. The goal is to enlist the student's enthusiasm for engineering in the process of learning a foreign language.

FLS 300 Introduction to Hispanic Literatures. *3(3-0-0). F,S. Preq: FLS 202.* 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: FLS 202.* 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: FLS 202.* 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: FLS 202; Recommended FLS 300.* 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: FLS 202; FLS 300 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, or permission of instructor.* 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 202.* 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 202.* 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 202.* 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 202.* 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 202.* 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.

FOREIGN LANGUAGES & LITERATURES-SPANISH - Continued

FLS 403 Hispanic Prose Fiction. *3(3-0-0). Preq: Consent of department.* 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: Junior standing.* 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 consent of department.* 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 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 (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 252 Introduction to Forest Science. *3(2-3-0). S. Not open to Forest Management majors.* 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.

FOR 260 Forest Ecology. *3(2-3-0). S.* Introduction to forest ecosysstems, 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 implementaion 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 274 Mapping and Mensuration. *4(1-12-0). Sum. Preq: Summer camp eligibility.* Procedures and instruments for measuring tree parameters, stand density and site index. Determination of log and tree volume and planning, conducting and summarizing a timber inventory. Basic land measurements and the mapping of boundary surveys, use of maps and GPS will be included.

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.

FORESTRY - Continued

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. *3(3-0-0). F. Preq: ARE 201.* Concepts and techniques for evaluating the profitability of long-term timber investments. Biological and market variables that affect profitability. Income tax treatment of timber income, including financial incentives provided through the tax system. Analysis of timer investment returns under a range of land, ownership, and market conditions. Emphasis on problem-solving.

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 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(3-2-0). 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 Class 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 319,304,374,434.* 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 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. Offered during spring break, as a one week field trip to Mexico and/or Central America.* 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.

FOR (NR) 420 Watershed and Wetlands Hydrology. *4(3-3-0). F. Preq: SSC 200, BO 360. Credit will not be given for both FOR(NR)420 and FOR(NR)520..* 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.

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. *4(3-3-0). S. Preq: FOR 303,319,353, FW 353, ST 311. Coreq: FOR 304,FOR 374,ENT 402, PP 318.* Management science and operational techniques in forestry. Road layout, construction, and machine systems: harvesting machine optimization, and selection. Harvesting, production and forest planning. Linear programming, queuing, decision and inventory theory, and other techniques for solving problems typically encountered in forest operations management.

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.

FORESTRY - Continued

FOR 460 Renewable Resource Policy and Management. *3(3-0-0). 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 histories.

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 Food Engineering. *S. 4(3-3-0). Preq: PY 211.* Engineering concepts and their applications to the food industry. Mass and energy balances and principles related to fluid flow, heat transfer, steam generation and use, psychrometry, and refrigeration.

FS 290 Preparing for Careers in Food Science. *F. 1(1-0-0). Preq: Sophomore standing in Food Science.* Careers and opportunities related to the food and allied industries and in governmental agencies. Development of professional enhancement skills; resume preparation; interviewing techniques; leadership development; communication; team building. Benefits of undergraduate research or internship experiences and continuing education.

FS 295 Special Topics in Food Science. *F,S,Sum. 1-4.* 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. Food science majors may use as a free elective only.* 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.

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 processed meat 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. Offered only as a world wide web course through the Office of Instructional Telecommunications.* 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.

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 Food Chemistry. *3(2-3-0). F. Preq: CH 220 or 221.* Molecules and reactions that account for the texture, flavor, color, stability and nutritional value of foods. Major emphasis on mechanisms and control of reactions involving carbohydrates, proteins, lipids and biological pigments.

FS 403 Food Analysis. *4(2-6-0). S. Preq: FS 402.* Principles, methods and techniques for quantitative physical and chemical analyses of food and food 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 of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms 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 416 Quality Control of Food Products. *3(2-3-0). S. Preq: FS 402, MB 351.* Organization and principles of quality control for the food industry. Physical, chemical, microbiological and sensory analysis. Total quality management, risk assessment, hazard analysis and critical control point (HAACP), water quality, wastewater analysis and reduction, cleaning and sanitation, and statistical quality control.

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 required. Credit will not be given for both FS 453 and FS 553.* 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.

FOOD SCIENCE - Continued

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 Science. *S. 3(1-6-0). Preq: FS 231, FS 402, FS 405.* 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.

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 & 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 managing mountain 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.

FISHERIES & WILDLIFE SCIENCES - Continued

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 Fishery 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 (FOR) 485 Natural Resources Advocacy. *3(2-3-0). F,S. Preq: ENG 333. Jr. or Sr. Level 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.

GRAPHICS 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. Credit cannot be given for both GC 101 and GC 120.* Introduction to technical graphics and computer-aided drawing. Major emphasis is on describing the shape and size of spatial problems by traditional and computer-aided drawing (CAD) methods. Application of graphical approaches to solve three-dimensional problems.

GRAPHICS COMMUNICATIONS - Continued

GC (IE) 210 Introductory Engineering Graphics for Industrial Engineering. *3(2-2-0). F,S. Preq: E 115. Credit can be given for only one of the following: GC 101, GC 120, or GC/IE 210.* 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.

GC 211 Introductory Engineering Graphics for Mechanical and Aerospace Engineers. *3(2-2-0). F,S. Preq: E 115. Credit can be given for only one of the following: GC 101, GC 120, or GC 211.* 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.

GC 250 Engineering Graphics II. *3(2-2-0). F, S, Sum. Preq: GC 120 or GC 210 or GC 211.* Advanced engineering graphics concepts and analytical skills relevant to the preparation of design, detail, and assembly production drawings for communicating technical data utilizing 2D & 3D sketching, instruments, and CADD methods. General manufacturing materials and processes, and the representation of common fasteners, basic machine elements, and structural components.

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 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. Designed for Engineering and technical students.* 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 & Consent of Instructor.* 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. College of Design majors only.* 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. *F. 3(1.50-3-0). 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. College of Design majors and approved minors only.* 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. Coreq: GD 410,GD 417. Graphic Design majors only.* 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 I. *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 only/other College of Design majors by permission of department head.* 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.

GRAPHIC DESIGN - Continued

GD 410 Imaging for Graphic Design III. *F. 3(1.50-3-0). 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. College of Design majors only.* 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 125, 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.

GENETICS - Continued

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 gentics, DNA isolation, electrophoresis, and Southern blotting.

GN 413 Advanced Genetics. *3(3-0-0). F,S. Preq: GN 411. Students cannot receive credit for both GN 413 and GN 513.* 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.

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.

FOREIGN LANGUAGES & LITERATURES - 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.

FOREIGN LANGUAGES & LITERATURES-GREEK- Continued

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.

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 trottage.

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. *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.

HISTORY - Continued

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 protect, 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). Restricted to CHASS first-year students.* Topical introductory history course in the CHASS First-Year Seminar 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: 3 hours of history or Sophomore standing. Coreq: HSS 100. History majors only.* 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 computing terms, 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 (MDS) 340 Perspectives in Agricultural History. *3(3-0-0). Preq: Jefferson Scholars Program or permission of instructor.* Historical topics related to the heritage of agriculture, the biological sciences, and the relationship among agriculture, technology, science and society.

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 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. Credit for both HI 400 and HI 500 is not allowed.* The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C.

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 or permission of instructor. Credit will not be given for both HI 404 and HI 504.* 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.

HI 405 History and Archaeology of the Roman Empire. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 405 and HI 505.* Analysis of Rome's rule over the Mediterranean World in the first four centuries A.D. through the use of literary and archaelologic sources. Special emphasis on imperial army and frontier security.

HI 406 From Roman Empire to Middle Ages. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 406 and HI 506.* 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.

HI (REL) 407 Islamic History to 1798. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. 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

HISTORY - Continued

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.

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 or permission of instructor. Credit will not be given for both HI 409 and HI 509.* 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.

HI 410 Italian Renaissance. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 410 and HI 510.* 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 princedoms of the 14th through the 16th century.

HI 411 The Protestant and Catholic Reformation of the 16th Century. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 411 and HI 511.* 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.

HI 414 France in the Old Regime. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 414 and HI 514.* 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.

HI 415 The French Revolution. *3(3-0-0). Preq: Junior standing or permission of instructor. Credit will not be given for both HI 415 and HI 515.* 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.

HI 418 Fascist Italy and Nazi Germany. *3(3-0-0). F. Preq: Junior standing or permission of instructor. Students will not receive credit for both HI 418 and HI 518.* 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.

HI 419 Modern European Imperialism. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 419 and HI 519.* 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.

HI 420 European Diplomatic History. *3(3-0-0). S, Sum. Preq: 3 hours of history. Credit will not be given both for HI 420 and HI 520.* 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.

HI 421 European Intellectual History: The Eighteenth Century. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 421 and HI 521.* Historical examination of some of the major figures of the European Enlightenment, beginning with Locke and ending with Kant.

HI 422 European Intellectual History: The 19th Century. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 422 and HI 522.* 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.

HI 425 Tudor and Stuart England. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 425 and HI 525.* 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.

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 or permission of instructor. Credit will not be given for both HI 430 and HI 530.* 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.

HI 431 Germany: Luther to Bismarck 1500-1871. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 431 and HI 531.* Germany from the Reformation to the completion of national unification in 1871. Emphasizes the impact of socioeconomic changes on politics and culture.

HI 432 History of Germany Since 1871. *3(3-0-0). Alt. yrs.(even). Preq: 3 hours of History. Credit will not be given for both HI 432 and HI 532.* Germany from the Reformation through national unification. Emphasis on the impact of socio-economic changes on politics and culture.

HI 435 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 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 or permission of instructor. Credit will not be given both for HI 439 and HI 539.* 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.

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 or permission of instructor. Credit will not be given for both HI 441 and HI 541.* 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.

HISTORY - Continued

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. *3(3-0-0). Al.t yrs. Preq: Junior standing or permission of instructor. Credit for both HI 443 and HI 543 is not allowed.* The origins and growth of the U. S. Constitution from its English common law heritage to the Modern era. Federalism and judicial interpretation; economic, social, and political movements; expansion of constitutional authority in the 20th century.

HI 446 Civil War and Reconstruction. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 446 and HI 546.* Examination of sectional polarization of the 1850's, impact of the war on both northern and southern societies, and trauma of reconstructing the Union.

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 or permission of instructor. Credit will not be given for both HI 448 and HI 548.* 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.

HI 449 U.S. Labor to 1900. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 449 and HI 549.* History of work, workers, and working-class organizations and politics in colonial and nineteenth-century America.

HI 450 U.S. Labor Since 1900. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 450 and HI 550.* History of work, workers, and working-class organizations and politics in twentieth-century America.

HI 452 Recent America. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given both for HI 452 and HI 552.* 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.

HI 453 United States-Latin American Relations Since 1823. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given both for HI 453 and HI 553.* 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.

HI 454 History of U.S. Foreign Relations, 1900-Present. *3(3-0-0). Preq: Junior standing or permission of instructor. Credit for both HI 454 and HI 554 will not be allowed.* 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.

HI (AFS) 455 History of the Civil Rights Movement. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given both for HI 455 and HI 555.* 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.

HI 456 Early American Thought. *3(3-0-0). Alt. yrs. Preq: 3 hours of history and junior standing. Credit will not be given for both HI 456 and HI 556.* American intellectual history to 1865. Influence of reformation, enlightenment, scientific revolution, capitalism and romanticism on social and political order.

HI 457 Twentieth-Century U.S. Intellectual History. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit for both HI 457 and HI 557 is not allowed.* American intellectuals and their views on 20th-century topics such as politics, culture, race and gender in historical context.

HI 458 Modern American Historical Biography. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 458 and HI 558.* Credit will not be given for both HI 458 and HI 558. American history in the 20th century through the medium of historical biography.

HI (REL) 460 American Religion After Darwin. *3(3-0-0). F,S. Preq: 3 credit hours in REL or HI. Credit for both HI(REL)460 and HI(REL)560 is not allowed.* 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.

HI 461 Civilization of the Old South. *3(3-0-0). Alt. yrs. Preq: junior standing or permission of instructor. Credit will not be given for both HI 461 and HI 561.* 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.

HI 462 Social History of the New South. *3(3-0-0). F. Preq: 3 hours of history. Credit will not be awarded both for HI 462 and HI 562.* Analysis of the change and continuity in the American South from the end of the Civil War through the present.

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 or permission of instructor. Credit for both HI 469 and HI 569 will not be given.* Comparative analysis of causes, participants, process, and outcome of revolutions in Mexico, Bolivia, Cuba, and Central America.

HI 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 or permission of instructor. Credit will not be given for both HI 471 and HI 571.* 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.

HISTORY - Continued

HI 472 Modern Japan, 1850 to Present. *3(3-0-0). Alt. yrs. Preq: 3 hours of history. Coreq: Credit will not be given for both HI 472 and HI 572.* 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.

HI 473 Japan's Empire in Asia, 1868-1945. *3(3-0-0). F, Alt. yrs.(even). Preq: 3 hours of history; Junior standing. Credit will not be given for both HI 473 and HI 573.* 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.

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. *F,S. 3(3-0-0). F,S. Preq: 3 hours of history. Credit will not be given for both HI 475 and HI 575.* 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.

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 hrs. of history. Credit will not be given for both HI 479 and 579.* 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.

HI 480 Scientific Revolution: 1300-1700. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 480 and HI 580.* 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.

HI 481 History of the Life Sciences. *3(3-0-0). Alt. yrs. Preq: Junior standing or permission of instructor. Credit will not be given for both HI 481 and HI 581.* 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.

HI 482 Darwinism in Science and Society. *3(3-0-0). S, Alt. yrs.(even). Preq: 6 hrs. of advanced history. Credit will not be given both for HI 482 and HI 582.* 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.

HI 483 Science and Religion in European History. *3(3-0-0). S, Alt Yr(odd). Preq: 3 hours of history; Junior standing. Credit will not be given for both HI 483 and HI 583.* 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.

HI 484 Science in European Culture. *3(3-0-0). F. Preq: 3 hours of history; Junior standing. Credit will not be given for both HI 484 and HI 584.* Relationship between science and culture in European history; evaluation of 'two cultures' thesis; scientific instruments, universal expos, science and literature.

HI (MDS) 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: Open only to seniors 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. Open only to seniors 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. Coreq: Membership in University Honors Program. Permission of the University Honors Program.* 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.

HON 102 Honors Colloquium II. *1(0-2-0). S. Preq: HON 101. Coreq: Membership in University Honors Program. Permission of the University Honors Program.* 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.

HON 291 Honors Special Topics-Mathematics. *3(3-0-0). F,S. Permission of the University Honors Program.* 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. Permission of the University Honors Program.* 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-History/Literature. *3(3-0-0). F,S. Permission of the University Honors Program.* 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/Religion/Arts. *3(3-0-0). F,S. Permission of the University Honors Program.* 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. Permission of the University Honors Program.* 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. Coreq: Membership in University Honors Program. Permission of the University Honors Program.* 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. Coreq: Membership in University Honors Program. Permission of the University Honors Program.* 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. Permission of the University Honors Program.* 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.

HON 496 Honors Capstone Seminar. *3(3-0-0). F,S. Coreq: Membership in University Honors Program. Permission of the University Honors Program.* 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.

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 125.* 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 125.* 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 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 125, 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 125 or 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 371 Interior Plantscapes. *3(2-3-0). S. Preq: BIO 125 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 411 Nursery Management. *3(2-3-0). F. Preq: BIO 125, 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. *3(2-4-0). F,S. Preq: HS 400; LAR 400.* Study and practice of plant selection process for ornamental planting design. Plant form, line, texture, color and scale are related to design principles. Plant cultural requirements and characteristics associated with site microclimates and conditions to promote environmentally sensitive and healthy landscapes. Hands-on experience. Two mandatory Saturday field trips.

HS 421 Physiology and Culture of Temperate-Zone Tree Fruits. *3(2-3-0). F. Preq: BIO 125 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 125; SSC 200; HS 201, and Permission 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 prodcution. Six all afternoon field trips are required.

HS 431 Vegetable Production. *4(3-3-0). F. Preq: BIO 125, 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 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 (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 & 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 101 CHASS First-Year Seminar. *0(0-0-0). F,S. Coreq: CHASS-Designated 1st year Seminar Sections. CHASS Freshmen Only (0-14 hours-*

exclusive of AP or IB credit). First-year seminar certification for majors in 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 200 Introduction to Women's Studies. *3(3-0-0). F.* Multidisciplinary approach to Women's Studies. Exploration of feminist scholarship and research about women and gender in contemporary American society.

HSS 210 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 211 Humanities and Social Sciences Scholars Forum. *0(2-0-0). 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 310 Humanities and Social Sciences Scholars Forum. *0(2-0-0). 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 311 Humanities and Social Sciences Scholars Forum. *0(2-0-0). 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 (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.

HSS 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.

HUMANITIES & SOCIAL SCIENCES - Continued

HSS 398 Scholars Seminar in Humanities and Social Sciences I. *3(3-0-0). F. Preq: Enrollment limited to participants in the Scholars of the College program.* Interdisciplinary study of selected topics in the humanities and social sciences; required of Scholars of the College students in their junior year.

HSS 399 Scholars Seminar in Humanities and Social Sciences II. *3(3-0-0). S. Preq: Enrollment limited to participants in the Scholars of the College program.* Interdisciplinary study of selected topics in the humanities and social sciences; required of Scholars of the College students in their junior year.

HSS 410 Humanities and Social Sciences Scholars Forum. *0(2-0-0). 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 411 Humanities and Social Sciences Scholars Forum. *0(2-0-0). 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 492 Seminar in Women's Studies. *3(3-0-0). S. Preq: HSS 200.* Examination of a topic or core area in Women's Studies, such as: women in literature, psychology of sex roles, changing gender relations in families, women's labor force participation, and the history of the women's rights movement.

INDUSTRIAL DESIGN

ID (GD) 102 Graphic and Industrial Design Fundamentals. *6(9-2-0). S. Preq: DF 101. College of Design majors only.* 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: DF 102. Coreq: ID 255, ID 318, ID 318L. Industrial Design Majors or permission of Department Head.* 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: ID 201. Coreq: ID 256, ID 418,ID 418L. Industrial Design Majors or permission of Department Head.* 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 Computer Imaging in the Design Process. *3(3-9-0). F. College of Design Students Only.* Introduction to the computer as a design tool for generating two-and three-dimensional representations of product concepts. Development of product form and documentation.

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. College of Design Students only.* 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 Studio Series. *6(0-9-0). F,S,Sum. Preq: ID 202. Coreq: ID 415. Industrial Design Majors or permission of Department Head/May be repeated.* 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.

ID 315 Digital Product Modeling. *3(3-0-0). S. Preq: 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: ID 300 or written approval of the Department Head. Industrial Design Majors or permission of Department Head/May be repeated.* 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 Design Processes. *3(3-0-0). S. Preq: ID 215. Industrial Design Majors or permission of Department Head.* A progression of advanced digital experiences that expand upon and combine the intellectual and conceptual skills required for 3-dimensional design visualization. Emphasis on solving product design problems through development and manipulation of form within the virtual environment.

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. College of Design students only.* 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.

INDUSTRIAL DESIGN - Continued

ID 494 Internship in Product Design. *3-6. F,S,Sum. Preq: Junior standing, 3.0 GPA or better. Maximum of 6 credit hours.* Supervised field experience in product design offices, galleries, museums and other related organizations.

ID 495 Independent Study in Industrial Design. *1-3. F,S. Preq: Junior standing, 3.0 GPA or better in Industrial Design. Maximum 6 credit hours - May be repeated.* Special projects in industrial design developed under the direction of a faculty member on a tutorial basis.

INDUSTRIAL ENGINEERING

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. 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 motion studies, and ergonomics.

IE 307 Real-Time Control of Automated Manufacturing. *3(2-2-0). F,S. Preq: CSC 114, IE 351. Coreq: ECE 331.* Introduction to the concepts of real-time control of manufacturing processes. Design and implementation of control systems for discrete and continuous systems. PID control, Fuzzy Logic, PLC ladder programming, multi-tasking computer control. Experience in the use of system emulation for design and analysis.

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: MAT 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: ST 371.* 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. For IE, ECE, and CSC majors and IE minors only.* 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 371 Furniture Production and Inventory Systems. *3(2-3-0). F. Preq: IE 307, ST 361. Coreq: IE 430.* Forecasting, inventory control, production planning and scheduling, shop floor control. Organization of production control; use of computers. Examples from the furniture industry.

IE 401 Stochastic Models in Industrial Engineering. *3(3-0-0). F,S. Preq: ST 371; MA 303 or MA 405.* 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 analysis of 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; 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.* 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. 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 331. 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 440 Furniture Management Analysis. *3(1-4-0). S. Preq: IE 311, IE 431, IE 371.* Economic decision making applied to the furniture industry. Selection of equipment, materials, methods and strategy from several feasible alternatives studied with the aid of actual case histories.

IE (CSC) 441 Introduction to Simulation. *3(3-0-0). F,S. Preq: MA 242, ST 372, programming proficiency.* 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 or equivalent. 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: Jr. 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, 408, 441, 443, 452, 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.

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: LAR 102. College of Design students only.* 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 or written approval of department head and dean.* 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 120/110 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 or equivalent program and approval of the International Study 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.

LANDSCAPE ARCHITECTURE - Continued

LAR 494 Internship in Landscape Architecture. *1-3. F,S,Sum. Preq: Jr. 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: Jr. 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.

FOREIGN LANGUAGES AND LITERATURES - 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 to discover 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.

MANAGEMENT

M 200 Microcomputer Applications for Business and Accounting. *1(0-2-0). F,S,Sum. Preq: Open to Accounting, Business Management, Economics, and Agricultural and Resource Economics majors only.* 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.* Enrollment is limited to students who have not received credit for a

calculus course or higher at NC State. Freshman may attempt the course twice while all other classifications of students may take the course once. MA 100 may not be counted as credit toward meeting graduation requirements in any curriculum. 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.

MA 101 Intermediate Algebra. *4(5-0-0). F,S,Sum. Preq: Credit for MA 101 is not allowed if student has prior credit in any other mathematical course. MA 101 may not be counted as credit toward meeting graduation.* 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 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. Credit is not allowed for both MA 107 and MA 111. 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.* Algebra and basic trigonometry; polynomial, rational, exponential, logarithmic and trigonometric functions and their graphs.

MA 108 Precalculus II. *3(3-1-0). F,S,Sum. Preq: C or better in MA 107. Credit is not allowed for both MA 108 and MA 111. Also, MA 108 should not be counted toward the GER mathematical sciences requirement. 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.* Algebra, analytic geometry and trigonometry; inequalities, conic sections, complex numbers, sequences and series, solving triangles, polar coordinates, and applications.

MA 111 Precalculus Algebra and Trigonometry. *3(3-1-0). F,S,Sum. Preq: Placement via Level Two Achievement Test or MA 101; Credit is not allowed for both MA 111 and either MA 107 or MA 108. Credit 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.* Real numbers, functions and their graphs (special attention to polynomial, rational, exponential, logarithmic, and trigonometric functions), analytic trigonometry.

MA 114 Introduction to Finite Mathematics with Applications. *3(3-0-0). F,S,Sum. Preq: MA 101 or equivalent completed in high school.* 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 121 Elements of Calculus. *3(3-0-0). F,S,Sum. Preq: MA 107 or 111 or placement via Level Two Achievement Test. 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.* 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.

MA 131 Calculus for Life and Management Sciences A. *3(3-0-1). F,S,Sum. Preq: C or better in MA 107 or MA 111 or placement via Level Two Achievement Test. Credit not allowed for more than one of MA 121, 131, and 141.* 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.

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. Credit is not allowed for more than one of MA 141), 131, 121.* 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.

MA 222 Applied Discrete Mathematics. *3(3-0-0). F,S. Preq: Programming knowledge, MA 141.* Formal logic. Methods of proof including induction. Introduction to grammars and finite state machines. Recurrence relations and asymptotic behavior of functions. Sets and counting. Boolean expressions and logic networks. Graphs and relations.

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. MA 121 is not an accepted prerequisite for MA 231.* 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 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 mimima. 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: Consent of Department Head.* 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; primarily intended for transfer students whose calculus backgrounds do not include a study of first and second*

order linear differential equations. Credit not allowed if MA 241 taken previously at NCSU. 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.

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. Credit not allowed if credit has been obtained for MA 301, 341 or 405.* 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.

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). Credit is not allowed for both MA 305 and MA 405.* 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.

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 314 Probability with Applications to Electrical and Computer Engineering.. *3(3-0-0). F,S. Preq: MA 242.* Fundamentals of discrete and continuous probability: conditional probability, independence, random variables, density and distribution functions, expected value and variance, common discrete and continuous distributions, joint distributions, and introduction to simple stochastic processes. Applications to electrical engineering; reliability of series and parallel circuits, models for waiting time phenomena.

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 are heat 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 G÷del 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). Credit is not allowed for both MA 301 and MA 341.* 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.

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.

MATHEMATICS - Continued

MA 401 Applied Differential Equations II. *3(3-0-0). F,S,Sum. Preq: MA 341 or 301. Credit for both MA 401 and MA 501 will not be given.* 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.

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. Credit is not allowed for both MA 403 and MA 407.* 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.

MA 405 Introduction to Linear Algebra and Matrices. *3(3-0-0). F,S,Sum. Preq: MA 241. Coreq: MA 242. Credit is not allowed for both MA 305 and MA 405.* 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.

MA 407 Introduction to Modern Algebra for Mathematics Majors. *3(3-0-0). Preq: MA 225. Credit is not allowed for both MA 403 and MA 407.* Elementary number theory, equivalence relations, groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, rings, polynomial rings, quotient fields, principal ideal domains, Euclidean domains.

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 414 Introduction to Differential Geometry. *3(3-0-0). S. Preq: MA 242 and MA 405.* Introduction to the geometry of curves in space, arc length, curvature, and torsion of curves; introduction to the geometry of surfaces in space; calculus of functions on surfaces, covariant derivatives, shape operators, metrics, curvatures of surfaces, geodesics, holonomy and other geometrical properties. Applications in the physical sciences and/or projects using computer algebra.

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 or MA 231. Credit for both MA 421 and MA 314 is not allowed.* 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 422 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 423 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, or equivalent.* 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 business decisions.

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.

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. MA (CSC) 427 is not a prerequisite.* 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.

MATHEMATICS - Continued

MA 491 Reading in Honors Mathematics. *2-6. F,S. Preq: Membership in honors program, consent of department.* 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: Consent of department.* Directed individual study or experimental course offerings.

MA 499 Independent Research in Mathematics. *1-6. F,S,Sum. 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..* Study and research in mathematics. Topics for theoretical, modeling or computational investigation.

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.

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MA 493 Special Topics in Mathematics. *1-6. F,S. Preq: Consent of department.* Directed individual study or experimental course offerings.

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MA 491 Reading in Honors Mathematics. *2-6. F,S. Preq: Membership in honors program, consent of department.* 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: Consent of department.* Directed individual study or experimental course offerings.

MA 499 Independent Research in Mathematics. *1-6. F,S,Sum. 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..* Study and research in mathematics. Topics for theoretical, modeling or computational investigation.

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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 491 Reading in Honors Mathematics. *2-6. F,S. Preq: Membership in honors program, consent of department.* 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: Consent of department.* Directed individual study or experimental course offerings.

MA 499 Independent Research in Mathematics. *1-6. F,S,Sum. 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..* Study and research in mathematics. Topics for theoretical, modeling or computational investigation.

MECHANICAL AND AEROSPACE ENGINEERING

MAE 206 Engineering Statics. *3(3-0-0). F,S,Sum. Preq: 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: MAE 206 with a grade of C or better, MA 242.* 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: C or better in MAE 301 and CSC 112.* 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 as well 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.* 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; MAE 208 with a grade of C or better or CE 215 or CE 213; CSC 112. 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, 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 practical convective 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: MAE 206 with a grade of C or better, MA 242. Coreq: MAT 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: MAE 208 with a grade of C or better, CSC 112 the analysis and design of machine and mechanical components. Coreq: MA 341; and a ME, AE major.* 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: MAE 314 with a grade of C or better, CSC 112. Coreq: MA 341; and a ME, AE, NE major.* 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 365 Propulsion I. *3(3-0-0). Preq: MAE 355 and a grade of C or better in MAE 301.* One dimensional internal flow of compressible fluids including: isentropic flow, normal shocks, flow with friction, simple heat addition. Applications to air-breathing aircraft propulsion systems and overall performance of air-breathing engines.

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.* 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, IE 311.* 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.

MECHANICAL AND AEROSPACE ENGINEERING - Continued

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 Systems. *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, 308, 310, 315, 316, ECE 331, and senior standing in ME.* 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 304. Coreq: MAE 412 & 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 308, MAE 310. Coreq: MAE 410.* Analysis and design of active and passive solar thermal systems for residential and small commercial buildings. Solar insolation, 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. Preq: MA 341.* 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 techniques for 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: Senior in MAE.* 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). 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). F. 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). S, 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). S. 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 control by 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). F. Preq: MAE 261, 461.* Longitudinal, directional and lateral static stability and control of aerospace vehicles. Lineralized 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 I. *3(3-0-0). S. 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 478 Aerospace Vehicle Design I. *2(1-3-0). F. Preq: MAE 356, 472. Coreq: MAE 462, 465. Available only to seniors in the Aerospace Engineering Curriculum.* A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

MECHANICAL AND AEROSPACE ENGINEERING - Continued

MAE 479 Aerospace Vehicle Design II. *3(1-6-0). F,S,Sum. Preq: MAE 478. A continuation of 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.

MAE 495 Special Topics in Mechanical and Aerospace Engineering. *F,S,Sum. 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. Preq: Completion of all required MAE-300 level courses. Coreq: MAE 415 or MAE 478. Departmental approval required.* 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.

MATERIALS SCIENCE AND ENGINEERING

MAT 200 Mechanical Properties of Structural Materials. *3(3-0-0). F,S. Preq: CH 101 and the first course in engineering mechanics. Not for materials majors.* An introduction to the atomic and grain structure of structural materials and their properties with emphasis on mechanical properties of metals; plastic deformation, cold and hot working and heat treatment of metals and alloys; residual stresses, fatigue, creep and corrosion phenomena; structural polymers and composites; physical examination and nondestructive testing of materials and structural components.

MAT 201 Structure and Properties of Engineering Materials. *3(3-0-0). 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.

MAT 210 Materials Characterization Laboratory. *2(1-3-0). S. Coreq: MAT 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.

MAT 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.

MAT 225 Chemistry of Polymeric Materials. *2(2-0-0). Preq: CH 201.* Bonding in molecular solids, structure and nomenclature of organic compounds relevant to polymers, nomenclature of polymers, polymerization of reactions and mechanisms for step growth polymerization, chain polymerization, copolymerization, and coordination polymerization.

MAT 301 Equilibrium and Rate Processes. *3(3-0-0). S. Preq: MA 241. Coreq: MAT 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.

MAT 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.

MAT 321 Phase Transformations and Diffusion. *3(3-0-0). S. Preq: MAT 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.

MAT 324 Polymer Characterization Laboratory. *1(0.50-1.50-0). F. Coreq: MAT 425 for MTE majors.* 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.

MAT 330 Crystal Chemistry and Phase Equilibria. *3(3-0-0). F. Preq: MAT 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.

MAT 331 Electronic Properties of Materials. *3(3-0-0). S. Preq: MAT 330. Coreq: MAT 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.

MAT 333 Electronic Properties Laboratory. *1(0-3-0). S. Preq: MAT 330.* 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 behavior and properties; electron beam techniques used to characterize devices.

MAT 350 Mechanical Properties of Materials I. *3(3-0-0). Preq: MAT 201, 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.

MAT (NE) 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.

MAT 423 Introduction to Materials Engineering Design. *3(3-0-0). F. Preq: MAT 435, 434, 450 and senior standing in MTE. Coreq: MAT 431, MAT 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.

MAT 424 Materials Science and Engineering Design Project. *3(1-6-0). S. Preq: MAT 423, 430, 431, 435, 434, 450 and senior standing.* 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

MATERIALS SCIENCE AND ENGINEERING - Continued

specialty areas including ceramics, metals, polymers, or electronic materials.

MAT 425 Introduction to Polymeric Materials. *3(3-0-0). Preq: MAT 225, MAT 301. Coreq: MAT 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.

MAT 430 Physical Metallurgy Laboratory. *1(0-3-0). F. Coreq: MAT 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.

MAT 431 Physical Metallurgy I. *3(3-0-0). F. Preq: MAT 321, 450. Coreq: MAT 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.

MAT 434 Ceramic Engineering Laboratory. *1(0-3-0). S. Coreq: MAT 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.

MAT 435 Physical Ceramics. *3(3-0-0). S. Preq: MAT 201, MAT 210. Coreq: MAT 321, MAT 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.

MAT 440 Processing of Metallic Materials. *3(3-0-0). F. Preq: MAT 321, MAT 450. Coreq: MAT 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.

MAT 445 Ceramic Processing. *3(2-3-0). Preq: MAT 434, 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.

MAT 450 Mechanical Properties of Materials II. *3(3-0-0). Preq: MAT 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

MAT (CHE) 455 Polymer Technology and Engineering. *3(3-0-0). F. Preq: MAT 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.

MAT 460 Microelectronic Materials. *3(3-0-0). Preq: MAT 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.

MAT 490 Special Topics in Materials Engineering. *1-4. Preq: Permission of Instructor.* Offered as needed for the development of new courses in materials engineering, including areas such as metals, ceramics, polymers, or microelectronic materials.

MAT 491 Materials Engineering Seminar. *1(1-0-0). Preq: Sr. 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.

MAT 495 Materials Engineering Projects. *F,S. 1-6. Preq: Jr. or Sr. 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.

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 or ZO 150) 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 methods of 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 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.

MULTIDISCIPLINARY STUDIES

MDS 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 majors and diversity.

MDS 102 Introduction to University Education II. *1(1-1-0). S. Preq: MDS 101.* Continuation of MDS 101

MDS 103 Images of the Future. *F. 3(3-0-0).* Basic principles of futures studies; history, problems, limitations, and methods of forecasting; questions of change, quality of life, complexity, technology, and values.

MDS 104 The Experience and Interpretations of Freedom. *F,S. 3(3-0-0).* Interdisciplinary introduction to freedom as a basic theme in history, culture, and personal life. Focus on interplay between the experience of freedom and its various interpretations.

MDS 105 A Systems Approach to the Universe. *S. 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.

MDS (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.

MDS 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.

MDS (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.

MDS 211 Eating through American 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.

MDS 214 Technology and Values. *3(3-0-0). F.* Introduction to the relations of technology and society. Emphasis placed upon the nature of technology, contrasting attitudes towards technology, technology's relation to the individual and to values, and to the future relations of technology and society.

MDS 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.

MDS (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 Monomotapa.

MDS (AFS) 241 Introduction to African-American Studies II. *3(3-0-0). F,S,Sum.* Second in a two semesters sequence in the interdisciplinary study of sub-Saharan Africa, its arts, culture, and people, and the African-American experience.

MDS 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.

MDS 252 Vienna in 1900. *3(3-0-0). Sum.* Interdisciplinary study of art, architecture, music and theater in turn-of-the-century Vienna and of the

MULTIDISCIPLINARY STUDIES - Continued

political and scientific thinking that surrounded these arts. Taught in Vienna.

MDS 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.

MDS 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.

MDS 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.

MDS 295 Special Topics in Multidisciplinary Studies. *1-6. F,S,Sum.* Detailed investigation of an interdisciplinary topic. Topic and mode of study to be determined by faculty member and/or teach team.

MDS 301 Science and Civilization. *3(3-0-0). F,S,Sum. Preq: Soph. 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.

MDS 302 Contemporary Science, Technology and Human Values. *3(3-0-0). F,S. Preq: Soph. 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.

MDS 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.

MDS 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.

MDS 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.

MDS (MUS) 306 Music Composition with Computers. *3(3-0-0). F,S,Sum. Preq: Some knowledge of music or computer science (e.g. CSC 200) or consent of instructor.* 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 on tape, a real-time piece, or a piece that combines tape and instrument(s).

MDS (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.

MDS 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.

MDS 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 nuclear accident, 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.

MDS 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.

MDS 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.

MDS 325 Bio-Medical Ethics: An Interdisciplinary Inquiry. *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.

MDS 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.

MDS 327 Modern Art-Modern Literature: 1880-1980. *3(3-0-0). S.* Interrelationship of art and literature, 1880-1980, from classic Modern movements to contemporary Post-modern movements; major figures, such as Picasso, Ernst, Magritte, De Kooning, Warhol, and Kiefer in art and O'Neill, Woolf, Faulkner, Beckett, Sartre, and Vonnegut in literature.

MDS 328 Sexuality and Values. *3(3-0-0). F.* Interdisciplinary examination of value issues related to sexual behavior and identity, pornography, homosexuality, and abuse.

MDS 330 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.

MDS (HI) 340 Perspectives in Agricultural History. *3(3-0-0). S.* Historical topics related to the heritage of agriculture, the biological sciences, and the relationship among agriculture, technology, science and society.

MULTIDISCIPLINARY STUDIES - Continued

MDS (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 Americas, 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.

MDS (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.

MDS (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.

MDS (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 and an African-centered world view. Discussion of contemporary issues within the African American community.

MDS (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.

MDS 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.

MDS 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.

MDS 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.

MDS 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.

MDS 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.

MDS 403 Seminar in Technology and Society. *3(3-0-0). S, Alt. yrs. Preq: Sophomore standing.* Exploration of the phenomenon of technology in society. The nature of technology, policy issues, the question of values, technological forecasting, and the implications of future technologies.

MDS 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.

MDS 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.

MDS (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.

MDS 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.

MDS 412 Entering the 21st Century: Agricultural, Technological and Environmental Perspectives. *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.

MDS (TAM) 414 Textiles and Society. *3(3-0-0). Alt. yrs. 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.

MDS 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 educator, e.g., in museums and parks, as a general introduction to tropical systems. Additional travel and trip costs are required beyond registration fees as well as appropriate immunization.

MDS (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.

MDS 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.

MDS 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

MDS (HI) 485 History of American Technology. *3(3-0-0). F,S. Preq: 3 hours of history.* Technology in American history: the ideological, social, economic, and institutional contexts of technological change from the 1760's to the present. Impacts of new technological systems.

MULTIDISCIPLINARY STUDIES - Continued

MDS 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.

MDS (WGS) 492 Theoretical Issues in Women's and Gender Studies. *3(3-0-0). S. Preq: MDS 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.

MDS (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.

MDS 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 date. Capstone course for students with an extensive background in one of the arts. Topics may vary.

MDS 495 Special Topics in Multidisciplinary Studies. *1-6. F,S.* Examination of selected topics of an interdisciplinary nature.

MDS 496 Topics in Film and Interdisciplinary Studies. *3(3-0-0). F,S.* Detailed examination of film within interdisciplinary contexts. Specific topics will vary from semester to semester.

MDS (AFS) 497 Topics in African-American Studies. *3(3-0-0). F,S. Preq: MDS 240.* Multidisciplinary examination of selected topics in African-American studies.

MDS 498 Independent Study in Multidisciplinary Studies. *1-3. F,S. Preq: Permission of instructor.* Independent investigation and discussion of a selected topic of an interdisciplinary nature.

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. Preq: 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 102 Geology II: Historical. *3(3-0-0). S. Preq: MEA 101. Recommended that MEA 111 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 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 111 Geology II Laboratory. *1(0-2-0). S. Coreq: MEA 102.* 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 120 The Dinosaurian World. *3(3-0-0). S, Alt. yrs(even).* 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). S, Alt. yrs(even). Coreq: MEA 120.* Companion to lecture course on "The Dinosaurian World." 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 only.* 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 200 Introduction to Oceanography. *3(3-0-0). F,S. Preq: High school physics, chemistry, algebra, trigonometry and biology or equivalent.* 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 210 Oceanography Lab. *1(0-2-0). 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 213 Fundamentals of Meteorology. *2(1-2-0). F. Coreq: MA 141.* Introduction to the discipline of and opportunities in meterology, 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.

MARINE, EARTH AND ATMOSPHERIC SCIENCES - Continued

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. *3(3-0-0). Preq: MEA 101 or MEA 140, or SSC 200.* Geologic aspects of the environment; man's effect upon and interaction with the various geologic processes; geologic considerations in land-use planning, waste disposal, and effective use of the earth's natural resources; geologic risks and hazards. Required field trip.

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 anthropoganic 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 330 Mineralogy and Optical Mineralogy. *5(3-6-0). F. Preq: MEA 101. Coreq: CH 101-102, MEA 110.* Fundamentals of crystallography, crystal chemistry, and crystal physics. Introduction to minerals as naturally occurring solid state materials. Characterization and identification of minerals on the basis of crystallographic features, physical and chemical properties, geologic occurrence, phase relations, and uses. Determination of the optical properties of non-opaque minerals, with

emphasis on petrographic thin sections. Systematic review of rock-forming minerals. Required weekend field trip.

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 curricula.* 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 Geologic Materials. *4(3-3-0). S. Preq: MEA 101; CH 101-102.* Basic principles of mineralogy and petrology. Common rock-forming and ore-forming minerals. Introduction to igneous, metamorpic, and sedimentary environments and rocks. Description and classification of common rocks and minerals. Required field trips.

MEA 411 Marine Sediment Transport. *3(3-0-0). F. Preq: MEA 101 or MEA 200, MA 241, PY 201 or PY 205. Credit not allowed for both MEA 411 and MEA 562.* 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.

MEA 412 Atmospheric Physics. *3(3-0-0). S. Preq: MA 242, PY 208 or equivalent.* 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 330; 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, 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-sphericaland 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 (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 330.* 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 simiplified models and methods. Barotropic model, Rossby waves, baroclinic structure, upper-level wave evolution, forecasting; surface cyclone evolution, Sutcliffe-Petterssenmodel. Numberical computation methods, numerical weather prediction and operational models, subjective and objective analysis of meteorological fields.

MEA 450 Introductory Sedimentary Petrology/Stratigraphy. *4(3-3-0). F. Preq: MEA 330.* 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). S. Preq: MEA 330 or 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 misroscale to regional tectonics. Required overnight field trips.

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 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 203 or PY 208. Credit is not allowed for both MEA 460 and MEA 560.* 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.

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-dimensional circulation of the ocean as a function of time.

MEA (PY) 463 Fluid Physics. *3(3-1-0). Preq: MA 341 and PY 208. Credit is not allowed for both MEA 463 and MEA 700.* 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.

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. *3(3-0-0). Sum. Preq: MEA 440, 450, 451. First part of six weeks out-of-state summer field camp. Both MEA 465 and MEA 466 must be taken in the same summer.* Geological field instruments and techniques. Geological field mapping of various geologic structures and terrains within areas of little deformed sedimentary strata. Additional fees required.

MEA 466 Geologic Field Camp II. *3(3-0-0). Sum. Preq: MEA 465. Second part of six weeks out-of-state summer field camp. Both MEA 465 and MEA 466 must be taken in the same summer.* Advanced geologic field techniques. Geologic field mapping in areas of complexly deformed rocks. Areas of volcanic, plutonic, or metamorphic rocks commonly mapped. Regional field trips between field stations. Additional fees required.

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). F. 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). Preq: PY 208. Credit may not be received for both MEA 471 and MEA 570.* 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 201/202, MEA 200. Credit is not allowed for both MEA 473 and MEA 560.* Chemical processes that control the composition of the oceans including discussions of chemical equilibria, biological cycling of nutrients, tracers of ocean circulation, minor and trace element distributions, and the chemical history of the marine environment.

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 or equivalent; ST 380 (MEA Majors). Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.* 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.

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 491 Seminar on Selected Geologic Topics. *2(2-0-0). S. 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: Consent of department.* 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.

MILITARY SCIENCE

MS 101 Introduction to Leadership and Values I. *1(1-1-0). F. Enrollment limited to freshman and sophomore students only.* 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.

MILITARY SCIENCE - Continued

MS 106 Map Reading. *1(1-1-0). S. Enrollment limited to freshman and sophomore students only.* 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, students will possess and understanding of leadership and officership, demonstrate the ability to apply these skills, and be prepared for the Advanced Military Science Program.

MS 301 Military Leadership and Training Management. *3(2-3-0). F. Preq: ROTC advanced course cadets.* 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: Advanced Course Cadet.* 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.

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

MUSIC - Continued

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.* Introduction to the art of music for the general student. Elements, formal principles, repertoires, compositional techniques, and survey of western stylistic periods from medieval to modern. Prior musical experiences (high school band, church choir, etc) recommended.

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 (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 (MDS) 306 Music Composition with Computers. *3(3-0-0). Preq: Some knowledge of music or computer science (e.g. CSC 200) or consent of instructor.* 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 on tape, 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 202 or 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. Preq: No previous formal training in music required.* 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 by native 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. Preq: No previous formal training in music required..* 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."

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.

MUSIC - Continued

MUS 390 Applied Music. *1(1-0-0). F,S. Preq: Restricted to students enrolled in Music Minor program. Department 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 Fundamentals of Nuclear Energy. *4(3-2-0). S,Sum. 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 301 Fundamentals of Nuclear Engineering. *4(3-2-0). F. Preq: MA 341,CSC 112(or equivalent), 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.

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.

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.

NUCLEAR ENGINEERING - Continued

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 (MAT) 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 and NE 402.* 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, decisions and methodologies. Nuclear power plant and fuel cycle economics.

NE (PY) 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

NE (PY) 415 Electromagnetism II. *3(3-0-0). S. Preq: NE 414.* A continuation of NE 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. Not open to majors in Nuclear Engineering.* 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 fusion reactor development.

NE (CHE) 485 Management of Hazardous Chemical and Radioactive Wastes. *1(1-0-0). F. Junior Standing. Credit will not be given for both NE 485 and 585..* Seminar series designed to provide an introduction to the management of both hazardous chemical and radioactive wastes. Topics include: hazardous waste treatment and disposal, pollution prevention, radioactive waste management, Superfund policy, state and federal regulations and risk assessment.

NE 491 Special Topics in Nuclear Engineering. *1-4. Preq: Consent of Instructor.* Detailed coverage of special topics.

NATURAL RESOURCES

NR 100 Introduction to Natural Resources. *2(1-3-0). F. Open to Natural Resources, Forest Management and University Undesignated students only.* 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.

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: NR 100. Junior standing, NR majors only or with instructor consent.* 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 coduments from NR 501 students; preparation for summer work experience.

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 360. NR majors only or with Consent of Instructor.* 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 (FOR) 420 Watershed and Wetlands Hydrology. *4(3-3-0). F. Preq: SSC 200, BO 360. Credit will not be given for both FOR(NR)420 and FOR(NR)520..* 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.

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. Credit will not be given for both NR 421 and NR 521.* 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.

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.

NATURAL RESOURCES - Continued

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 Midshipman 4/C Naval Science Laboratory. *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 220 Naval Ships Engineering Systems. *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 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 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 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 410 Naval Weapon 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.

NAVAL SCIENCE - Continued

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. Food science majors may use as a free elective only.* 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.

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. Credit will not be given for both NTR (FS)400 and NTR 500.* 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.

NTR (ANS, PO) 415 Comparative Nutrition. *3(3-0-0). F. Preq: 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: ANS 230, ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415.* Current concepts and physiological bases of the roles of nutrition in the maintenance of health during the different stages in the life cycle and in the prevention and therapy of specific disease states in humans.

NTR 490 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 492 External Learning Experience. *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. *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. *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.

POLYMER AND COLOR CHEMISTRY

PCC 105 Introduction to Polymer and Color Chemistry. *3(2-0-0). F.* Introduction of topics related to Polymer and Color Chemistry, e.g. computers, library, PCC curriculum, advising and elective selection, introducto 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. *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 presented by 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 106 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 TC 105, TMS 221, 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 TC 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: TC 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: TC 301. Coreq: CH 223.* Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing.

PCC (TAM) 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.

PCC 402 Introduction to the Theory and Practice of Fiber Formation. *3(3-0-0). Preq: Senior standing; TC 203, PY 208 or 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: TC 301 or 302, TT 221, 241 and 251 or TMS 210 or TE 301 and 302 and senior standing. Sr standing.* An overview of all aspects of carpet production and marketing including fiber properties and selection, yarn formation, carpet formation,

POLYMER AND COLOR CHEMISTRY - Continued

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: TC 310, TC 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 CH 331 or TE 303.* Application of certain analysis techniques to fibers, textile chemicals and processes: ultraviolet, visible and infrared spectroscopy; chromatograph viscometry; interfacial tensiometry; calorimetric, gravimetric and mechanical thermal analyses. Emphasis on solving problems of analysis involving such processes as sorption, diffusion, crystallization. This is the capstone course in PCC, and emphasizes application of students' learning from previous courses, project work, presentations and other activities relevant to a capstone course experience.

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 (CH) 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 490 Undergraduate Research in Textile Chemistry. *3(0-6-0). Preq: TC 442 or CH 433, TC 301, CH/TC 461.* Faculty-supervised individual research for undergraduates in TC.

PCC 492 Special Topics in Textile Chemistry. *1-3. F,S. Preq: permission 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. Individual under medical care must have prior approval from physician before registering for the course.* 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 and Wellness 1 hour requirement for graduation.

PE 104 Swim Conditioning. *1(0-2-0). F,S, Sum. Preq: PE 215 or equivalent skills.* 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 cardiorespiratory 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 or equivalent skill.* 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 need to 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 Aerobics. *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 or equivalent skills.* 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. For students with medical problems who are unable to take regular Physical Education classes.* Designed for students with physical or medical problems, accommodating individual needs and limitations. Repeatable up to four semesters.

PE 219 Gymnastics. *1(0-2-0). F,S.* Fundamentals of gymnastics for men and women. Coed: 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 or equivalent skill.* 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 or equivalent skills.* Advanced techniques of Lifeguard Training with American Red Cross certification upon completion of course requirements. Optional fee assessed for certification.

PHYSICAL EDUCATION - Continued

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 or equivalent skills.* 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 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 or equivalent.* 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 or equivalent experience.* 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: Preq: PE 214 or equivalent skills.* 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 a required weekend fieldtrip costing approximately $25.

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.* 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. Two weekend field trips required.

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.

PE 260 Intermediate Equitation. *1(0-2-0). F,S. Preq: Beginning Equitation or equivalent.* Advanced techniques, theories and performance in equitation. Additional fee assessed

PHYSICAL EDUCATION - Continued

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 or equivalent; ability to pass swim test.* 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. Additional fee assessed.

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 or equivalent.* 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 or equivalent.* 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 student athletes on a team sponsored by the Athletic Department for one hour of Physical Education.* For students on a team sponsored by the Athletic Department. Course not repeatable.

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: Pass swim test.* Whitewater rafting skills and practices emphasizing safe river travel, minimal impact river camping techniques, and trip planning. Additional fee assessed.

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 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, utlizing 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 or equivalent skills.* 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. Planning and participating in a twelve-day field trip required. Approximate cost of $190 will be assessed.

PE 295 Special Topics in Physical Education. *1(0-2-0). F,S.* Examination of selected topics of physical education.

PHYSICAL EDUCATION - 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. This course does not constitute credit toward meeting the minimum university Physical Education requirements.* Knowledge and skills necessary for designing and implementing strength and conditioning programs.

PEC 301 Coaching Practicum. *1(0-4-0). F,S. Preq: 15 hours of PE.* A seven-week practical coaching experience in a junior high 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. This course does not constitute credit toward meeting Physical Education requirements.* Practical and theoretical concepts essential to the preparation of coaches.

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.

PHYSICAL EDUCATION - FITNESS

PEF 303 Fitness Practicum. *1(2-0-0). F,S. Preq: Permission of Instructor. This course does not constitute credit toward meeting the physical education requirement..* A 10 week practical fitness specialist experience in a fitness specific setting within the triangle area.

PEF 334 Principles of Exercise Programming. *3(3-0-0). F,S,Sum. Preq: PEC 478. This course does not constitute credit toward meeting the Physical Education requirement.* Fundamentals and scientific principles necessary to plan, design, implement, and evaluate individual exercise programs.

PHYSICAL EDUCATION - 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: PRT/PEG 210. PGM Majors only.* Advanced concepts, techniques, and practices of teaching golf; golfer development programs, golf club design and repair.

PHYSICAL EDUCATION – HEALTH STUDIES

PEH 212 Alcohol, Drugs and Tobacco. *2(2-0-0). F,S. This course does not constitute credit toward meeting the Physical Education GER requirement.* Theories of drug use, pharmacology, tolerance, dependence, nicotine, alcohol usage, alcoholism, sedative-hypnotics, narcotics, amphetamines, cocaine, marijuana, hallucinogens, steroids and treatment.

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. Does not satisfy the physical education requirement.* 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.

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 285 Personal Health. *2(2-0-0). F,S. This course does not constitute credit toward meeting the Physical Education GER requirement.* 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.

PEH 286 Nutrition, Exercise and Weight Control. *2(1-2-0). F,S. medical request.* 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.

PEH 287 Stress Management. *2(2-0-0). F,S. This course does not constitute credit toward meeting the Physical Education GER requirement.* Impact of stress upon the psychological and physiological function of the body. Exploration and interaction with stress management techniques.

PHYSICAL EDUCATION - 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). Sum.* Skills for backcountry travel and camping. Techniques for planning, organizing and leading backcountry trips. Course will be conducted between spring and summer session. To include an 8 day outing. Approximate cost to student: $150.00.

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 and high and low ropes course events. Safety and risk management issues and facilitation techniques presented and discussed.

PEO 302 Practicum Experience in Outdoor Programs. *2(0-4-0). F,S,Sum. Preq: PEO 214, PEO 215, PEO 216, PEH 280 or equivalent.* 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.

PHYSICAL EDUCATION - SPORTS

PES 291 Officiating Basketball. *1(1-0-0). S.* Rules, interpretations, signals and mechanics of officiating basketball. Out-of-class officiating required.

PHILOSOPHY – (also see RELIGION)

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 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 275 Ethics. *3(3-0-0).* 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 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 and Medieval Philosophy. *3(3-0-0).* Western philosophy of the ancient world and Middle Ages, 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 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 306 Philosophy of Art. *3(3-0-0). Preq: One philosophy course other than LOG 201 or 335; or one course in visual and performing arts.* Analysis of the concepts and theories encountered in discussion of art in such a way as to illuminate the nature of works of art, esthetic experiences, and art criticism.

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 311 Philosophical Issues in Medical Ethics. *3(3-0-0). Preq: One of the following: PHI 275, 309, 312, 313, 321, or 322.* Such issues as the morality of abortion, suicide, and euthanasia; the meaning and function of the concepts of health, illness, and death; psychological intervention; paternalism in medicine; consent and medical experimentation; and the allocation of scarce medical resources. Consideration of individual rights and fairness. Emphasis on conceptual clarity and the assessment of moral principles.

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 275 or 321.* 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 314 Issues in Business Ethics. *3(3-0-0).* 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 321 Contemporary Moral Issues. *3(3-0-0).* 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 322 Philosophical Issues in Environmental Ethics. *3(3-0-0). Preq: One of the following: PHI 275, 309, 311, 312, 313, 321, or 325.* Arguments and principles surrounding moral questions about the environment: whether non-humans have moral standing; duties to future generations; policy regarding population, common resources, pollution; preserving biodiversity, forests; property rights; efficiency and equity considerations; decision-making associated with global risk-taking, e.g., global warming.

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 (PSY) 425 Introduction to Cognitive Science. *3(3-0-0). Preq: One upper-level course in either PHI, PSY, CSC or Linguistics. Credit cannot be given for both PHI/PSY 425 and PHI/PSY 525.* 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.

PHI 440 The Scientific Method. *3(3-0-0). S. Preq: One upper-level course in philosophy. Credit cannot be given for both PHI 440 and PHI 540.* 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.

PHI 450 Software and the Ethics of Ownership. *3(3-0-0). S, Alt. yrs(odd). Offered on-line only; on-campus attendance required for final exam. Credit cannot be given for both PHI 450 and PHI 550.* 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.

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 275, 298, 306, 309, 311, 313, 321, 322, 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 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 498 Special Topics in Philosophy. *1-6. Preq: Six credits in PHI.* 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: Consent of Associate Dean.* 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 processed meat items.

PO (ANS, FS) 350 Introduction to HACCP. *3(3-0-0). F,S. Offered only as a world wide web course through the Office of Instructional Telecommunications..* 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.

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 of environmental 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. Coreq: PRT 152.* 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. Coreq: PRT 150 for PRT majors only.* 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. PGM Majors only.* 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: PRT/PEG 210. PGM Majors only.* 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. 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. 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 maintenance principles.

PRT 266 Introduction to Sport Management. *3(3-0-0). F.* 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 315 Organization and Administration of Adventure Programs. *3(3-0-0). S, Alt. yrs(odd). 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. 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 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 375 Internship Orientation. *1(0-1-0). F. Preq: PRT 152 and departmental approval.* Preparation for recreation and park internship. Resume writing, interviewing skills, cover letters and internship search techniques and resources.

PARKS, RECREATION AND TOURISM MANAGEMENT - Continued

PRT 380 Analysis and Evaluation in Parks, Recreation. *3(2-2-0). F,S. Preq: 300-level Statistics course; CNR 134; 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, BUS 360. Credit will not be given for both PRT 407 and PRT 507.* 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.

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). F. 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). 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). 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: PRT 156. PGM Majors, Senior standing.* 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 Trining 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. Preq: CNR 134.* 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 475 Recreation and Park Internship. *8(0-27-0). F,S,Sum. Preq: PRT 350, PRT 358, PRT 359, PRT 375, PRT 380.* 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 477 Park, Recreation and Tourism Management. *3(3-0-0). F,S. Preq: Senior standing. Must be taken during student's last semester of coursework.* 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.

PRT 491 Special Topics in Recreation. *1-3. F,S,Sum. Preq: Consent of department.* 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. Restricted to 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 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 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 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.

POLITICAL SCIENCE - Continued

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, Frederick Douglass, 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) or equivalent.* 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, MDS) 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. Preq: PS 311 and junior standing. Credit will not be given for both PS 415 and PA 515.* Politics and administration in the American system of justice.

PS (WGS) 418 Gender Law and Policies. *3(3-0-0). F. Preq: Nine hours of Political Science or Permission of Instructor.* 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. Preq: 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 433 Global Problems and Policies. *3(3-0-0). F. Preq: 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). Preq: 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 its contemporary context.

PS 443 Seminar in Latin American & Caribbean Politics. *3(3-0-0). S. Preq: Six hours of political science including PS 231. Credit cannot be given for both PS 443 and PS 543.* Comparative political development in Latin America and the Caribbean. Emphasis on democratization and implications for US foreign policy.

PS 445 Comparative Systems of Law and Justice. *3(3-0-0). Preq: PS 311 and junior standing. Credit will not be given for both PS 445 and PS 545.* 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

PS 462 Seminar in Political Theory. *3(3-0-0). S. Preq: 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 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. Preq: Consent of department.* 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. Preq: Admission to Honors Program and Consent of Instructor. Admission to Honors Program and Consent of Instructor.* Independent reading and preparation of an honors thesis in political science.

PS 498 Special Topics in Political Science. *3-6. F,S. Preq: Six hours PS.* 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. Freshmen only.* 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. Preq: PSY 200. Coreq: PSY (ST) 241. For PSY and HRD majors only.* 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. Preq: PSY 200. Coreq: PSY (ST) 240. For PSY and HRD majors only.* Students design, analyze and report a variety of simple experiments.

PSY (ST) 242 Introduction to Behavioral Research II. *3(3-0-0). F,S. Preq: PSY (ST) 240. Coreq: PSY (ST) 243. For PSY and HRD majors only.* 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. Preq: PSY (ST) 240. Coreq: PSY (ST) 242. For PSY and HRD majors only.* Design and analysis of a major research project.

PSY 307 Industrial and Organizational Psychology. *3(3-0-0). F, S, Sum. Preq: PSY 200 or 201, juniors and seniors.* 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. Preq: PSY 200 or 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. Preq: PSY 200.* 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. Preq: PSY 200 or 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 and an 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: Junior standing. Coreq: PSY 495, COM 112. For HRD majors only.* 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, 201 or 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 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, 201 or HSS 200. Credit cannot be given for both PSY 406 and PSY 506.* 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.

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, or permission of instructor.* 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 or equivalent.* 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.* 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.

PSYCHOLOGY - Continued

PSY 475 Child Psychology. *3(3-0-0). F,S. Preq: PSY 200 or 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 476 Psychology of Adolescent Development. *3(3-0-0). F,S,Sum. Preq: PSY 200 or PSY 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: Jr. standing. For HRD majors only.* Supervised practicum in a human resource development organization during two consecutive semesters. Application of human resource development knowledge and skills.

PSY 498 Psychology Honors Seminar. *3(1-4-0). As needed. Preq: Permission of department; HRD and PSY honors students. Must take two semesters.* 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

PSY 499 Individual Study in Psychology. *1-6. F,S. Preq: Permission of the Department. 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: Course available for Physics majors only.* 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. Credit cannot be earned for both PY 204 and PY 205.* 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.

PY 205 Physics for Engineers and Scientists I. *4(3-3-0). 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. Enrollment subject to approval of Physics Department, and limited to students who have passed PY 204. Not open to students having credit for PY 205.* Approximately ten experiments taken from the fields of mechanics, sound, heat and thermodynamics.

PY 208 Physics for Engineers and Scientists II. *4(3-3-0). F,S,Sum. Preq: PY 205 and MA 241 with grade of C or better.* Second semester of a two-semester sequence in introductory physics, with laboratory. A calculus-based study of electricity, magnetism, optics and modern physics.

PY 211 College Physics I. *4(3-2-0). F,S,Sum. Preq: MA 107 or MA 111. Credit not allowed for both PY 211 and either PY 201 or PY 205.* First semester of a two-semester introductory sequence in non-calculus physics, with laboratory. Mechanics, heat, wave motion and sound.

PY 212 College Physics II. *4(3-2-0). F,S,Sum. Preq: PY 211. Credit not allowed for both PY 212 and either PY 202 or PY 208.* Second semester of a two-semester introductory sequence in non-calculus physics, with laboratory. Electricity, and magnetism, light, modern physics.

PY 299 Special Problems in Physics. *1-3. F,S.Sum. Preq: Consent of department.* 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.

PHYSICS - Continued

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 Space Time 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. Credit not allowed for both PY 203 and PY 407.* Major developments in modern physics: special relativity, origin of the quantum theory, atomic and molecular structure, radioactivity, properties of nuclei.

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. Senior Physics students only.* Introduction to laboratory electronics and instrumentation. Experiments in mechanics; electromagnetism; electronics; optics; and atomic, nuclear, plasma and solid state physics.

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: Consent of department.* Study and research in physics. Topics for experimental or theoretical investigation.

RELIGION (also see PHILOSOPHY)

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 (FLH) 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.

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 326 The Catholic Traditions. *3(3-0-0). S.* The history, basic teaching and cultural influences of Roman Catholicism and Eastern Orthodoxy.

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 practices of 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 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 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

RELIGION (also see PHILOSOPHY) - Continued

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 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 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 and methodological 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. Course may be used for individualized study programs by arrangement with the instructor.* Critical analysis of advanced theological works; close reading of primary texts; methods of interpretation (hermeneutics).

REL 496 Seminar in Religious Studies. *3(3-0-0). Preq: 300-level course in Religion and consent of instructor. Open primarily to Religious Studies majors and minors.* Advanced research and writing in selected topics; application of contemporary and historical methods for the study of religion; hermeneutic theory.

REL 498 Special Topics in Religion. *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 (also see ANTHROPOLOGY)

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.

SOCIOLOGY (also see ANTHROPOLOGY) - Continued

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 300 Social Research Methods. *4(3-2-0). F,S,Sum. Preq: 3 cr. in SOC 200 level. 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 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 or equivalent research methods course.* 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 or equivalent research methods course.* 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 (WGS) 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.

SOC 410 Sociology of Organizations. *3(3-0-0). Preq: 3 cr. in SOC, 200 level, SOC 300 or equivalent research methods course.* Application of sociological theories to study of organizational structures and processes. Special attention to control and coordination, relations with other organizations, and decision making.

SOCIOLOGY (also see ANTHROPOLOGY) - Continued

SOC (PS) 413 Criminal Justice Field Work. *4(2-8-0). F,S. Preq: SOC 306 and PS 311, 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 or equivalent research methods course.* 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 or equivalent research methods course.* 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 or equivalent research methods course.* 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 or equivalent research methods course.* 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 inequality that 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 or equivalent research methods course.* 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 or equivalent research methods course.* 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 440 Social Change. *3(3-0-0). S. Preq: 3 cr. in SOC, 200 level; SOC 300 or equivalent research methods course.* 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 institutional settings. 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, or equivalent research methods class.* 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 or equivalent and SSC 200 or equivalent.* 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, 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. Credit will not be given for both SSC 470 and SSC 570..* 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.

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 of soil 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). Credit not allowed if student has prior credit for another ST course.* 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.

ST (PSY) 240 Introduction to Behavioral Research I. *3(3-0-0). F,S. Preq: PSY 200. Coreq: PSY (ST) 241. For PSY and HRD majors only.* 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.

ST (PSY) 241 Introduction to Behavioral Research I Lab. *1(0-2-0). F,S. Preq: PSY 200. Coreq: PSY (ST) 240. For PSY and HRD majors only.* 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 (ST) 240. Coreq: PSY (ST) 243. For PSY and HRD majors only.* 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 (ST) 240. Coreq: PSY (ST) 242. For PSY and HRD majors only.* Design and analysis of a major research project.

ST 301 Statistical Methods I. *3(3-0-0). Preq: MA 141, CSC 110 or CSC 112.* 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). Credit not allowed if student has prior credit for another ST course or BUS 350.* 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.

ST (BUS) 350 Economics and Business Statistics. *3(3-1-0). F,S,Sum. Preq: MA 114; EC 201 or ARE 201.* 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 problems encountered 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. Credit not allowed for both ST 361 and ST 370 or ST 380.* 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.

ST 370 Probability and Statistics for Engineers. *3(3-0-0). F,S. Preq: MA 241. Credit not allowed for both ST 370 and ST 361 or ST 380.* 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.

ST 371 Introduction to Probability and Distribution Theory. *3(3-0-0). F,S,Sum. 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,Sum. 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. Credit not allowed for both ST 380 and ST 361 or ST 370.* 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 curve and surface fitting (regression analysis).

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 of hypotheses, 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. Preq: 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 simulation experiments. 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 Consent of Department.* Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction.

SOCIAL WORK

SW 201 Community Social Services. *3(3-0-0). F.* 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. Pre-professional work experience included..

SW 290 The Development of Social Welfare and Social Work in the U.S. *3(3-0-0). F,S. Preq: SW 201.* Major programs and policy developments in U.S. social welfare from colonial period through the early 1900s including institutionalization, charity organization, New Deal, the war on poverty, and reform efforts in the 1950s. Emphasis on the development of the social work profession in the 20th century.

SW 300 Social Work Research Methods. *3(3-0-0). F,S. Preq: SW 201. Coreq: ST 311 or consent of instructor. Social Work Majors or Minors.* 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 or consent of instructor.* Theory regarding human

social functioning for students intending to practice social work. Emphasis on biological, psychological, social and cultural factors in human life.

SW 320 Social Work Practice I. *3(3-0-0). F,S. Preq: SW 201. Social Work majors only.* First of a three-course sequence on generalist social work practice. Professional values, ethics, roles and interviewing skills. Volunteer work in a social service agency.

SW 405 Social Work Practice II. *3(3-0-0). F,S. Preq: SW 320. Social Work majors only.* Second of a three-course sequence on generalist social work practice. Theory and practice methods with individuals, families and small groups. Volunteer work in a social service agency.

SW 408 Social Work Practice III. *3(3-0-0). F,S. Preq: SW 320. Coreq: SW 405. Social Work majors only.* Third of three-course sequence on generalist social work practice. Theory and practice of effecting planned change in and with communities and organizations.

SW 410 Multi-Cultural Social Work. *3(3-0-0). Preq: SW 310.* Study of social service provision to diverse populations with particular emphasis on implications for social work practice. Population groups will include African Americans, Asian Americans, Caucasians, Gays and Lesbians, Hispanic Americans, Native Americans and selected religious groups.

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 or permission of instructor.* 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, Alt. yrs.(even). Preq: SW 201 or consent of instructor.* Social work practice with children and families. Emphasis on child welfare programs and the development of assessment and case planning skills. Methods of protective services, adoption, and foster care are studied.

SW 416 Substance Abuse and Social Work Practice. *3(3-0-0). F. Preq: SW 201 or consent of instructor.* Social Work practice regarding methods for prevention, identification, assessment, treatment, and referral of persons with alcohol and other drug-related problems.

SW 420 The Legal Aspects of Social Work. *3(3-0-0). F,S. Preq: Social Work majors and 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: SW 320. Coreq: SW 405, SW 408. Social Work Majors.* 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: SW 405, SW 408, SW 480. Social Work majors only.* 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: Nine credits in social work courses. Must be Junior or Senior with a major or minor in Social Work.* 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 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. Not open to students required to take TT 105; open to transfer students.* 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.

T 210 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 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. Limited to three hours per student.* 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.

T 495 International Collaboration in Textiles Research. *1-6. F,S,Sum. 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 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.* 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 271 Computer-Aided Textile Design. *3(1-4-0). S. Preq: DF 101 or ADN 111. 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.*. Introduction to the operation of design software for woven, knitted and printed textiles. Adobe Photoshop, Pointcarre' and Monarch programs will be taught. Peripheral equipment essential to the design process will be included. Field trips to area textile design centers.

TAM 315 Apparel Production I. *3(2-2-0). F. Preq: TAM 218.* Concepts and practices for the production of basic apparel items, beginning with selection of fabric and other raw material garment components and extending through computerized pattern development, pattern grading, and pattern engineering. Techniques for development of styled patterns and for solution of problems of fit.

TAM 316 Apparel Production II. *3(2-2-0). S. Preq: TAM 315.* 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.

TAM 317 Computer-Aided-Design I for Apparel. *3(1-3-0). F,S. Preq: TAM 315.* Introduction to the operation of industry design software for apparel & other sewn products. U4ia and/or Artworks visual design programs, Gerber Accumark or Lectra pattern design programs, and other programs used by the industry to create, market or visualize products will be taught. Peripheral equipment essential to the design process will be included.

TAM 371 Woven Textile Design. *3(1-4-0). S. Preq: TT 105 and a grade of C- or better in ADN 111 of DF 101. For students admitted to Design Minor only.* 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.

TAM 372 Knitted Textile Design. *3(1-4-0). F. Preq: Grade of C or better in ADN 111 or DF 101. For students admitted to Design Minor only.* 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-integrated Design Systems and an awareness of industrial processes.

TAM 380 Management and Control of Textile and Apparel Systems. *3(3-0-0). F,S. Preq: TT 221, 241 and 251 or JR standing in Textile Engineering.* Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.

TAM 382 Principles of Soft Goods Marketing. *3(3-0-0). F. Preq: EC 201. Credit not allowed for both TAM 382 and BUS 360.* Principles of marketing textiles in the consumer goods sector. Emphasis on market segmentation, product strategy, pricing decisions, promotion and channels of distribution. Interface between textile manufacturers and those producing apparel and upholstered furniture. Marketing channel for apparel to the retailer.

TAM (PCC) 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 (MDS) 414 Textiles and Society. *3(3-0-0). Alt. yrs. 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 Apparel Product Development. *3(1-3-0). F. Preq: TAM 316.* Introduction to 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 Apparel Production III. *3(2-2-0). S. Preq: ST/BUS 350 or ST 361; TAM 316.* Traditional and non-traditional workplace designs for textile and apparel production. Applications of computerized predetermined time study, work measurement, and line balancing techniques as production optimization tools in labor-intensive environments. Emphasis on computer applications for simulation and management of apparel production, product data management, payroll, and incentive systems.

TAM (TT) 431 Quality Management and Control In Textile Manufacturing. *3(3-0-0). F,S. Preq: TT 221, TT 241,TT 251, 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 Production Management Decisions for Textile Operations. *3(2-2-0). F,S. Preq: TAM 380, ACC 280 or 210, BUS/ST 350 or ST 361, MA 132 or equivalent, senior standing.* Quantitative techniques for decision making and management in a textile/apparel environment.

TAM 481 Product Costing in the Textile and Apparel Industry. *3(2-2-0). F,S. Preq: TT 221, TT 241, TT 251,TAM 218 or equivalent, TAM 380 and ACC 280 or for TT majors JR standing.* 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 (BUS) 482 Textile Marketing Management. *3(2-2-0). F,S. Preq: TAM 382 or BUS 360, TAM 380. Coreq: TAM 380.* The development and state of the art of current textile marketing management theory and practice are covered in classroom sessions. Management lab sessions include experiential, marketing games, and role-playing exercises. Current industry practice and government relations are stressed.

TEXTILE AND APPAREL MANAGEMENT - Continued

TAM 483 Textile and Apparel in International Trade. *3(3-0-0). F. Preq: EC 201.* Course presents the textile and apparel industries in the global setting of trade and markets.

TAM 484 Management Decision Making for the Textile Firm. *3(3-0-0). F,S. Preq: TAM 380 and senior standing.* 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 Manufacturing. *3(3-0-0). F. Preq: TAM 380.* Survey of computer integrated manufacturing (CIM) systems in the textiles and apparel industries. Topic discussed include: computer aided design (CAD); computer aided manufacturing (CAM); computer aided engineering (CAE); material handling systems; automation and robotics; information systems; and Internet resources.

TAM 486 Total Quick Response in the Textile Industry. *3(3-0-0). S. Preq: TAM 380.* Survey of planning and control strategies in the Integrated Textile Complex for creating a Total Quick Response environment. Case studies of textile operations with field trips to textile manufacturing companies.

TAM 487 Textile and Apparel Labor Management. *3(3-0-0). F. Preq: Sr. 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. Courses may be taken twice provided projects are different subject matter..* Directed research in Textile and Apparel Management through experimental, theoretical and literature studies in textile and apparel-related problems.

TAM 491 Special Topics in Textile and Apparel Management. *1-3. F,S. Preq: Sr. 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 or equivalent 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.

TT (TAM) 499 Textile Senior Project. *4(2-0-4). F,S. Senior standing. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses.* 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.

TEXTILE CHEMISTRY

TC 491 Seminar in Textile Chemistry. *1(2-0-0). S. Preq: TC 310, TC 320 and senior standing.* Familiarizes student with the principal sources of textile chemistry literature and emphasizes importance of keeping abreast of developments in the field. Emphasizes fundamentals of technical writing. Reports, lectures arranged.

TEXTILE ENGINEERING

TE 105 Introduction to Textile Engineering Practice. *2(2-0-0). F. Coreq: E 115.* Emphasis on engineering design approaches, team-based design, total quality and real-world constraints. Development of leadership and teamwork skills and oral and written communication skills. Emphasis on preparation for academic success.

TE 201 Textile Engineering Science. *4(3-2-0). S. Preq: MA 241, TC 203, PY 205.* Structure, physical and mechanical properties of fibers; structure of assemblies. Structure/property relations. Laboratory exercises in characterization of fiber properties.

TE 205 Textile Engineering Systems. *4(3-2-0). S. Preq: C- or better in CSC 114, PY 208. Coreq: MA 341.* An holistic systems engineering approach to modeling electrical and mechanical systems. Basic circuit principles, the analysis of simple filters, examples of DC motors and rotating machinery. Laplace Transforms, block diagrams and matrix algebra.

TE 301 Textile Manufacturing Processes and Systems I. *4(3-2-0). Preq: MAE 206, 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 Thermal Processes in Textile Engineering. *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. Emphasis on thermodynamic properties and the First and Second Law analysis of systems and control volumes. Emphasis on textile processes. Analysis of basic power cycles.

TE 305 Textile Instrumentation and Control. *3(3-0-0). Preq: MA 341, TE 205.* Linear feedback control systems using transfer functions. Transient and steady-state responses using root-locus, Bode plots and Nyquist diagrams. Classical control theory techniques to determine and modify the dynamic response of a system. Emphasis on textile applications and processes.

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 440 Textile Information Systems Design. *4(3-3-0). F. Preq: CSC 340, TE 305.* Textile information system design, real-world constraints. Principles of hardware, software, security and ethics issues. Emphasis on solving a real world problem.

TEXTILE ENGINEERING - Continued

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). 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: Permission 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 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 ofwood 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 foundry work.

TED 221 Construction Technology. *3(1-4-0). S.* 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 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 384 Computer Applications in Industry. *3(1-4-0). S.* Computerized control systems used in industry including computers and controllers, automated machines, and robots. Students design and operate automated systems.

TED 430 Manufacturing Technology. *3(1-4-0). F. Preq: GC 120, TED 115 or TED 122.* Manufacturing organization, product design, and production system design. Students design, operate and evaluate a small-scale manufacturing system.

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 for middle school and secondary school students.

TED 476 Transportation Technology: Energy and Power. *3(1-4-0). F. Preq: MA 111, PY 231.* Theoretical and practical aspects of transportation. Topics include energy, energy conversion, transmission, and control; transportation systems and industries; and conservation of energy. Emphasis on laboratory testing, experimenting, developing; and on the use of equipment.

TED 490 Special Problems in Technology Education. *F,S. Preq: Junior level standing and permission of Instructor.* Supervised, independent investigation in a defined area of interest in Technology Education.

TEXTILE MATERIAL 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, TC 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: Permission 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 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 Toxciology 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. Preq: TAM 217; TT 221. Coreq: MA 131 or MA 141; CH 101.* 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 fibers that are practically and aesthetically desirable. Design of end products as well as fundamental economic and supply chain issues.

TT 221 Yarn Production and Properties I. *3(2-2-0). F, S, Sum. Preq: MA 131, PY 211 or PY 205, TT 105.* 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 Fiberweb and Nonwoven Production. *3(2-2-0). F. Preq: MA 231 or 241, PY 211 or 205. Coreq: ST 361, PY 212 or 208.* Fiberweb/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. Plant visits whenever possible.

TT 321 Yarn Production and Properties II. *3(2-2-0). F, S. Preq: TT 331.* 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 361 or BUS 350, TMS 211, TT 221, TT 251, and MA 231 or equivalent.* 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 II. *3(2-2-0). S. Preq: 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, manufacture and 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 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 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 221, PY 211 or 205, MA 231 or 241, 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 251, 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 370.* 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 (TAM) 499 Textile Senior Project. *4(2-0-4). F,S. Senior standing. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses.* 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.

VETERINARY SCIENCE

VMF 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.

VMF 420 Diseases 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.

VMS 490 Special Topics in Veterinary Medicine. *1-6. Preq: Approval of department. Undergraduate students only.* Offered as needed

to cover new or special subject matter within the scope of veterinary medicine at the undergraduate level.

WOMEN'S AND GENDER STUDIES

WGS (MDS) 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,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.

WGS (MDS) 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.* 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 (MDS) 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. Credit cannot be given for both PSY 406 and PSY 506.* 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.

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 (PS) 418 Gender Law and Policies. *3(3-0-0). F. Preq: Nine hours of Political Science or Permission of Instructor.* 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). Credit will not be given for both HI 448 and HI 548.* 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.

WGS (MDS) 492 Theoretical Issues in Women's and Gender Studies. *3(3-0-0). S. Preq: MDS 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 (MDS) 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. Preq: None.* 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 acqueous 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 calculation and 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.* 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(3-0-0). S. Preq: WPS 360. Coreq: 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. Tem 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. *1(0-2-0). S. Coreq: WPS 416.* 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.

WOOD AND PAPER SCIENCE - Continued

WPS 450 Wood Industry Case Studies. *2(1-0-3). S. Preq: Sr. 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: Sr. 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).* 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). Preq: ZO 150 for Zoology majors; BIO 125 or equivalent for non-majors.* 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 and ecology 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.

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 410 Introduction to Animal Behavior. *3(3-0-0). F. Preq: ZO 150 or ZO 260 or Consent of Instructor.* Studies of animal behavior in vertebrates and invertebrates including physiological mechanisms and adaptive significance.

ZOOLOGY - Continued

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: BO 360 or ZO 260. Credit in both ZO 419 and ZO 519 is not allowed.* 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.

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 or equivalent.* 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 or equivalent or Consent of Instructor. 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 or equivalent.* 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 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 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.

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